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THE FUNCTIONS OF A UNIVERSITY LABORATORY[1]

ON an occasion like the present, when we are gathered to congratulate this university upon the addition which it has just made to the existing equipment of the world for the prosecution of scientific studies, it seems appropriate, and it may not be entirely superfluous, to spend a little time in inquiry what it is that scientific laboratories have done for mankind during their comparatively brief past; to ask also how we may make them still more serviceable in the years which are to come.

It is not so very many years ago that a speaker upon this subject might have deemed it necessary to prove to his hearers (if he could) that laboratories were of service to the public and that they ought to be established and maintained. I am very glad that this is no longer necessary; that I may assume with confidence your acquiescence in the belief that scientific studies have been justified by their results. And I am very glad also that these results, great as they are, have, as yet, nothing like finality about them. To say that the natural sciences are still very imperfect and capable of vast improvements is only another way of saying that they are alive. Those of us who are devoted to their service have especial reason for joy in the fact that there is still so much to be done that we see no prospect of this service becoming unnecessary in our time or in that of our successors for many generations.

When one speaks of the beneficial results

[1] Address on the occasion of the opening of the Carnegie Science Building at Acadia University, Wolfville, N. S., October 21, 1909.

of scientific studies, it is only natural that the first things which arise in the mind should be the concrete things—the great practical benefits which have become so much a part of our lives that we wonder how our ancestors could have been comfortable without them. We think of all that the engineers have done for us with steam and electricity; and we remember that all the modern industrial applications of electricity had their origin in Faraday's laboratory; that wireless telegraphy, which has added to the security of all those who go down to the sea in ships, was born in the laboratory of Hertz. In our admiration of the great achievements of genius we do not forget the humbler services of lesser men who have attended to the details; who have made improvements here and there; and who, in the aggregate, have contributed incalculably to the results which we see all about us. But laboratories have done more than to provide opportunities for discoveries great and small, which are afterward put to the practical service of mankind. In them has been trained the great army of experts who keep the machinery of our industrial civilization running, and upon whose skill and knowledge we depend every day more than we know for safety, prosperity and comfort. This educational function of laboratories is of the greatest importance from whatever point of view we regard the subject, and we shall have occasion again to consider it more in detail.

It is not only in the domain of engineering (which is mainly applied physics) that we see these great, tangible results. Chemistry and biology are in no way behind their sister science in the direct benefits which they have conferred upon us. We have only to think of the enormous improvements which the study of chemistry has made possible in manufactures, in metallurgy and in many other branches of industry, to recognize what chemistry has done for the world. And in addition to such services, chemistry has powerfully assisted biology in the magnificent contributions which have been made to the cause of human health and security within the past two or three decades. Even a partial enumeration of these advances is convincing. Antiseptic surgery, the germ theory of infectious diseases, antitoxins, methods of stamping out such plagues as malaria and yellow-fever, the lessening of infant mortality—can any one compute how much sorrow and suffering have been prevented by these discoveries? And without laboratories and without men trained in laboratories, we should have had none of them.

All these things are obvious enough; even the "man in the street" is not in much doubt about them. But is there anything beyond this, anything less tangible and therefore more difficult to state and to perceive, anything higher and nobler than these concrete practical services? We should not, I think, find such entire unanimity in answer to this question as we encounter with regard to the so-called practical results of the sciences. Many people who have not thought much about the matter and some people who have thought much, but whose work and sympathies lie in other directions, would still be inclined to define science as "useful knowledge" with a very narrow signification of the word useful. To such persons, the sciences find their sole excuse for existence in their practical applications; if they look with amused tolerance upon the enthusiasm of spectacled professors over a discovery in pure science, it is only because they have come to realize that, in the course of time, even the most unpromising discovery may have important practical applications. Of course we have no monopoly of such unsatisfactory supporters; the

philistine is a thorn in the flesh of artists and moralists—especially the patronizing philistine. But I am inclined to think that men of science have more than their just share of that sort of thing; that, in other words, the number of people who can appreciate (if only dimly) the idea of art for art's sake is far greater than the number of those who can understand why science should be cultivated irrespective of its possible applications.

On the other hand, the professed followers of pure science regard the "useful" consequences of their work as a mere by-product—and one which must not be allowed to usurp the chief place in their hopes and plans. In fact, they are sometimes accused (and with some show of justice) of leaning too far in the other direction and despising everything that is practical. This undoubtedly is a wrong attitude and a very short-sighted one; no one who takes an unprejudiced view of the matter can doubt that, apart from their general beneficial effects, the applications of science have a most favorable reaction upon the progress of purely scientific studies. Not only does the prospect of useful technical results bring to scientific studies much greater support and financial aid than they would otherwise enjoy, but the progress of technology always assists in many ways the science with which it is most closely connected—by the development of instruments and appliances upon a commercial scale, by the purely scientific problems which are suggested in the course of the development of the applications, and by the stimulus which comes from the activity of large numbers of earnest men in closely related lines of work. Many things are easy to us to-day which would have caused Faraday infinite trouble and labor, just because the electrical engineers have been busy in producing such cheap and convenient instruments and appliances.

I can not leave this phase of the subject, however, without attempting to offer an excuse for the somewhat intolerant attitude which the student of pure science sometimes assumes toward his brother who deals only with its useful applications. Almost every successful man of science is constantly tempted to engage in technical work of some kind. Invitations come to him which mean an opportunity to do work which is obviously useful to the world. He knows that the material rewards for such work are usually much greater than for purely scientific achievements and he usually needs money as much as other people. He knows too that in all probability he will gain much more general commendation and applause along with the money; for the contemporary fame of even a very distinguished scholar is limited to a surprisingly small circle of people. At a recent academic celebration the degree of doctor of laws was conferred upon a number of prominent and well-known men; honorary degrees in letters and in science were also conferred, and a wise and observant spectator said afterward that the recipients of these latter degrees must have been distinguished scholars, for he had never heard of any of them before.

Well, our man of science knows these things and he is sorely tempted; but he also knows that if he yields he must give up the better part of his scientific work; he knows that there are ten men willing to take up the popular and profitable task for every one who is content to devote his time and energy to the other. So he resists the temptation; and if it helps him and comforts him to regard the part which he has chosen as the better part, as a little more honorable and dignified and worthy than the one which he has refused, we can hardly wish to deny him that consolation.

But is he right in his action? Is the ideal for which he is giving up money and possible fame one which is worthy of the sacrifice? Is there anything in science beyond its more obvious utilities? To put the question in another way, has this new laboratory and others like it throughout the world any other legitimate function than the training of technical experts and the making of discoveries which may be useful in a direct material way? I hope you will agree with me that it does have other functions to perform and that they are higher and more important than those we have been discussing.

As before, these activities are manifested chiefly in two directions—in the education of youth and in the discovery of new truth; in teaching and in research. Only in this case, we mean by teaching not simply the training of an expert for a particular task, the fashioning of a cog to be slipped into its proper place in the industrial machine, but the fostering and bringing a little nearer to perfection of a human mind and of all its powers, intellectual, esthetic, moral.

Can the study of the sciences do these things for us or any of them, and can we perhaps conclude that they are especially well adapted to perform certain parts of this task of general development of mind and character?

I must admit at once that, to the great majority of students, the esthetic aspect of science makes a very small appeal. In fact it is supposed by many people to be entirely lacking. Every one who has seriously studied one of the physical or natural sciences, however, knows that it is there, and that it is indeed one of the greatest incentives and rewards for such study. A great scientific theory with its component parts accurately adjusted to each other in due proportion and subordination, with great complexity of detail blended into the grandeur of perfect simplicity; such a structure makes upon the mind which is fitted to enjoy it an impression of beauty which is quite comparable with that which is produced by a French cathedral, a play of Shakespeare or a symphony of Beethoven. But it must be admitted that the ability to enjoy this kind of art is rarer and perhaps requires a longer apprenticeship than the appreciation of literature or music or painting. We must, of course, take into account that it is the fashion to pretend to like music and pictures even if one does not really enjoy them, while, on the other hand, there is, fortunately, no temptation to feign a liking for scientific pursuits. But when all such allowances are made, I think there can be little doubt that the number of people who find esthetic stimulus in music, for example, is much greater, and that the number who find it in literature is enormously greater, than the number who can see the beauty of science.

When we turn to the consideration of the more purely intellectual faculties we shall not, I believe, find the sciences at a disadvantage in comparison with other subjects used for the disciplinary training of young men and women. In the opinion of many people they possess indeed a certain superiority which especially fits them to serve some of the most important ends of education. Is there any justification for such an opinion? I think we must recognize, in the first place, that the experimental sciences possess a certain advantage in the relatively great simplicity of their subject matter. They are complicated enough—even physics, the simplest of all is quite sufficiently intricate—to give one all the work he wants in disentangling their puzzles. But the puzzles *are* disentangled and one definite and certain result

after another is arrived at. The problems we have to deal with are simple in comparison with those with which the historian, for example, has to struggle, at least if he attempts anything like the degree of completeness in his solution which we habitually attain. And just because we have attempted a relatively modest task, it has been done with a finish and degree of completeness which makes it particularly suitable to serve as a model of right thinking and as a means of training the minds of young people in the methods of attacking greater difficulties. Easy exercises in careful observation, right inductions, logical deductions, in which the result is definite and known, and a straying step can be detected at any point of the path—these do not make a bad beginning in the process of training the young mind to use its intellectual faculties to the best advantage.

I have called this process easy, and yet, as we all know, students do not regard it as altogether a path of roses; in fact they are usually of the opinion that economics or sociology is easier than (for example) physics. Now I am quite ready to admit that a process of close, accurate, careful thinking is never *very* easy; but if a man is to be well educated he must have training in such processes, and I am contending that it is possible in the experimental sciences, on account of their relative simplicity, to lead men along such paths and to guide and check their progress with a degree of precision that is too difficult even to be attempted in subjects of study which deal with more complex bodies of facts. They therefore seldom attempt it, and the student finds them easy; but he has missed a very vital part of education if he has not been through this particular mill.

I have been regarding scientific studies from the disciplinary point of view, as valuable to the individual student, especially if his after life is to be devoted to something else than science, because they supply him with a standard of careful and exact thinking to which he may approximate as closely as he can in the more complicated affairs of life. I think we may find some justification for this view of the place of scientific studies in the education of the individual, by a little consideration of the position which such studies have occupied in the history of the general development of thought since they have become conspicuous factors in that development. Nobody can doubt that their direct influence has been very great; and it is not at all certain that their indirect effect upon the attitude and methods of scholars in other fields of study has not been nearly or quite as great. We all know that philologians, historians, moralists, even some literary critics, have a very different point of view and very different methods of work from their predecessors of three hundred years ago. They think more of facts and less of words; they are more cautious in reaching conclusions and in defining the probability of the correctness of their results; they are more careful to guard against being prejudiced by external circumstances and implications; they get as near to first-hand evidence as they can. A great many of them are proud of using a "scientific" method and most of them habitually give the name of science to their subjects of study.

Now I am far from assuming that the so-called scientific method is, in its details, an entirely new invention; it is, after all, only applied common-sense and men have been using it in practical affairs since before the dawn of history. But its use as a definite, conscious, consistent policy, the recognition of its value and of its limitations, the perfection of its application, these, I believe, we do owe mainly to the

initiative of the students of the experimental sciences; and that the rest of the world of scholars owes much to their example. Here again I must make a qualification lest I should be misunderstood. I do not wish to imply that the essential priority which is thus claimed for the experimental sciences is due to any superior wisdom on the part of its students; on the contrary, I believe that it was the comparative simplicity of the task they had before them which enabled them to teach the world how more difficult problems are to be solved when their time comes. And I wish to draw your attention to the parallel between this general process and the place which I have been claiming for scientific studies in the education of the individual student. If we are right in believing that the study of the experimental sciences is mainly responsible for this particular step forward in the intellectual development of mankind, then we must conclude that this is a greater, a higher, a more vital service than the invention of trolley-cars, the production of cheap dye-stuffs, or even the suppression of yellow fever. And if scientific studies are peculiarly adapted to the purpose of leading young men into the paths of careful, sensible, fearless, original thinking then these new laboratories of yours have a much higher educational function to perform than merely to produce engineers or technical chemists or practising physicians.

And now we come to a still more vital question; how about the young man's morals? Have scientific studies any ethical effect, and if so is it in the right direction or the wrong one? The problem is a specific one and so we may leave to one side the ancient question as to how much knowledge has to do with conduct. It may be that perfect knowledge of good and evil would inevitably result in the choice of the good and that the will would, under such ideal conditions, be the servant of the intellect. But we know, alas! that perfect knowledge of good and evil is no more the attribute of any human mind than perfect knowledge of scientific truth; and we see too many instances in which a man knows and approves the better path and yet follows the worse, to be able to believe that morality is a matter of knowledge alone. It is plain, however, that sound knowledge and intellectual judgment must in general be antecedent to the deliberate choice of virtue; and that some training of the will itself is possible; if it be led to choose the good and the true habitually in lesser things, it is more likely to react nobly in times of stress and difficulty. These are doubtless minor functions in the domain of morals, but they are very necessary ones; and I think it may be successfully maintained that the natural sciences are strong allies of the forces which are fighting on the side of virtue in the great battle of good and evil.

Let the truth be proclaimed though the heavens fall, has been and must continue to be the fundamental principle of real science. At times in the past it has seemed to many that the heavens were falling—but they have not fallen; on the contrary, they have acquired a new glory which our eyes had not before seen. The medieval church thought quite honestly that Galileo, if he were allowed to go on, might wreck the universe at least for those who believed him. But how different has been the real result of his labors and of the work of those astronomers who have followed after him. For us it is true, with a depth and intensity which David could not have known, that "the heavens declare the glory of God; and the firmament sheweth his handiwork."

So in the middle of the nineteenth cen-

tury there were many who believed that, if the theories of Darwin were allowed to prevail, we should see religion and morality involved in one common ruin. But we all know now that this has not happened; that, on the contrary, the doctrine of evolution has furnished us with new and valuable criteria for judging conduct; that it has given us additional reasons for hating sin and a rational basis for charity toward the sinner. And as a comment on the fears of those who in those times of storm and stress thought that science was the enemy of religion I may quote the concluding sentence of the address of the president of the British Association for the Advancement of Science, at the meeting in Winnipeg last summer, just fifty years after the publication of Darwin's great work:

> As we conquer peak after peak we see in front of us regions full of interest and beauty but we do not see our goal, we do not see the horizon; in the distance tower still higher peaks which will yield to those who ascend them still wider prospects, and deepen the feeling, the truth of which is emphasized by every advance in science, that "great are the works of the Lord."

We may, I am sure, dismiss from our minds the last lingering fear that the pursuit of science tends toward irreligion or immorality. We may go still further and with confidence deny the more common belief that physical science is unmoral, that it has no concern with ethical questions. On the contrary, its whole attitude and most fundamental enthusiasms are thoroughly permeated by the great ethical principles. No one who studies science aright can fail to recognize this fact; and no one who has taught the principles of any science to young men, and who has watched their after development, can doubt the strong, if indirect, effect which such studies have had upon them in the direction of clearer moral judgments and more unselfish devotion to duty.

I come now to the last of the important functions of a university laboratory which I wish to discuss before you to-day. It is scarcely necessary to say that this is research—not simply the attempt to add to man's material comfort by new appliances, not the seeking of useful knowledge in any narrow sense, but the diligent and devoted search after new truth for its own sake, careless of consequences so long as the truth is served. This is a great and lofty ideal and it is followed with all the enthusiasm and loyalty which a high ideal inspires, and which nothing else in the world can inspire. Now I should not for a moment wish to persuade you that the scientific investigator is actuated only by unselfish motives; he is not quite such a monster of virtue as that. Dr. Jowett once said that we were all liable to error—even the youngest of us; and it may be admitted freely also that we are all human—even the most scientific of us. But I am convinced from considerable observation of men of science that by far the strongest selfish motive which actuates them, especially those in the higher ranks of ability, is the great pleasure which they take in the work itself. That this pleasure is so keen and satisfying is a consequence of the ideal character of the work; it is the sort of pleasure which the artist finds in his real pictures—and does not find in his pot-boilers. It is true also that scientific men are very glad when they can obtain the commendation and respect of their professional brethren; but what soldier, what statesman, what minister of the gospel does not share in the desire for such intelligent approbation. It is a confirmation of his hopes that his strenuous labors are not in vain; and it adds a human element to his reward, the desire for which, if it is a weakness, is certainly an amiable one. The true man of science, the true scholar in

any department of knowledge, does not desire unintelligent popular applause; and it is almost always safe to conclude that the "newspaper scientist," the man whose name and deeds are constantly before the public, is not having a very great or beneficial effect upon the progress of his science.

True research, real scientific pioneering, does not strongly appeal to the general public; its applications may be remote, it shows no immediate profit, its achievements are not spectacular and are often too technical to be fully understood by any but experts. And thus it comes about that it must be fostered, encouraged and supported by the more enlightened fraction of mankind; and the chief agency through which this support may be given is the university or college. I will go further than this and express the decided opinion that no other institution has been devised or seems likely to be invented which can perform the task so well. Of late years there have been established a number of institutions of various types, especially for research; they have done excellent work and it has seemed to many that such foundations might probably absorb gradually the research functions of the universities. The ground for this expectation is that, as they have nothing else to do except to advance knowledge, whereas the universities must also teach young men, the institutions for research alone must inevitably surpass the universities in achievement and eventually take over the whole business of research. We must remember, however, in the first place, that research is not altogether a business, but an art as well; and that while organization and division of labor may be the life of business, it is not the soul of art. To produce the highest results in scientific research there must be individuality and freedom, and there is room for far more individuality in a university laboratory than in any special research laboratory which has hitherto been established or seems likely to be established.

There is a certain sort of new knowledge which can be gained more readily by the well-organized, machine-like attack of government departments and special institutions than by the guerilla warfare of the universities. There are great bodies of facts, relations, properties of matter, and habits of living beings which have only to be looked for to be found; as soon as we have time, money, a corps of trained men, and especially proper organization, we may count upon a steady annual crop of new knowledge of this kind. Institutions of the type we have been discussing are doing admirable service to science by pushing forward such work. It seems, *a priori*, almost inevitable that their work should be mainly in this direction; it is the work for which their organization is best fitted—and it is a sure thing. When an institution exists solely for research, when a man gets his salary for research alone, then the results must appear pretty regularly and promptly, or there is likely to be trouble. The institution, or the man, knows that he must reckon with human nature—especially with the human nature of administrative officers; and in consequence we find (as we should expect) that, in nine cases out of ten, the productions under such conditions are very steady, very voluminous, very meritorious and very dull. Now the collection of facts of this kind is most necessary, but it is *only* "the beginning of wisdom" in science; such collections are not science but only the raw material out of which science may possibly be made if the right men arise for the task. It is here that the university laboratory, that the college professor, has

his opportunity—an opportunity which has been made use of brilliantly in the past and which I hope and believe will not be neglected in the future. For the university professor is not compelled to stick to the sure thing in research; it is not necessary that he should make an annual or semi-annual contribution to science, for he has another excuse for living and drawing his salary. And so it comes about that he is much freer to attack bigger problems, the outcome of which is very uncertain and which may after several years of work lead to no conclusive result. Such work, if intelligently undertaken and carried out, is by no means a waste of time; great results are always accompanied by great risks; and no great discovery has ever been made by a man who was unwilling or unable to risk a great failure.

Even if we return to lower ground, to the "business" analogy which was used a moment ago, I believe that university laboratories are not at a hopeless disadvantage as compared with special institutions for research. For the most successful manufactory is not always the one which adheres most closely to one specialty but the one which most successfully utilizes its bye-products. Now I am a very strong believer in Lord Kelvin's opinion that in a university, so far as is humanly possible, every investigator should be a teacher and every teacher an investigator. The reaction of the two forms of activity on each other is immensely stimulating and helpful. To the man whose chief concern is the investigation of special problems on the remote borders of knowledge, it is very wholesome that he should occasionally survey his subject broadly and in simple terms, as he must do if he teaches young men. On the other hand, he conveys to them some part of his own enthusiasm and, in some cases, makes recruits for scientific investigation; and when he does this he multiplies his own effectiveness many times in the present and future activities of his pupils.

In the same way the man who, from natural bent, or from force of circumstances, finds his chief usefulness as a teacher, is greatly helped in the proper fulfillment of that most important service, if he can spend some part of his time in research. The teacher who does nothing else, who goes over the same subject year after year with successive classes, is of all men, I think, the most in danger of intellectual stagnation. While he is young he may ward off this paralysis by study, by the acquisition of knowledge which other men have discovered. But (with somewhat rare exceptions) the real passion for such acquisition and the pleasure one takes in it are nearly gone by the time middle age is reached. In fact a great deal of the capacity for such study has also vanished by that time. We all know how much easier it is to acquire a new language when one is young, and how much less patient we are of the drill and drudgery of grammar as the years go on. I do not believe I shall ever learn Russian or Swedish; certainly I should expect no pleasure in the early stages of the study. And I am quite sure that, if I had not learned the multiplication table when I was a boy, I should never learn it now and should be obliged to carry it about on a card in my pocket.

Now so far as I have been able to observe, the passion for research and the pleasure which it gives do not pall as the years go on. As we read the biographies of men of science we find that the fascination of the game is as strong or stronger to the veteran of seventy-five as to the youth of twenty-five. Unless ill-health or some other circumstance prevents, they usually keep steadily and enthusiastically at their

task until the end of life; and in many cases even serious decrepitude can not stop them.

So I believe that engaging in research is the best way and the only certain way for a teacher to keep himself alive intellectually and to retain his spirit and enthusiasm to the end. And even if the college he serves regards teaching and not research as its chief business, even then, I contend, he must be given a reasonable amount of time and reasonable opportunities for research in order that he may keep his intellectual health, just as he is given time for physical exercise in order that he may maintain his bodily health.

Fortunately too, the process is not an esoteric mystery open only to the elect, but a thing which can be taught and learned by ordinary men. It is true that great discoveries are not made by ordinary men —at least not often. But there is a great deal of useful work quite within the powers of almost any intelligent man which will add to the knowledge of the world and add to the happiness and usefulness of the man himself and to his success as a teacher. He must usually be taught the elements of the process and started on his career as an investigator in order to be able to accomplish much; and he must have some time and energy left over from his teaching to devote to this purpose. Both these conditions are being fulfilled more and more as time goes on; and the result will be, I believe, that the profession of the teacher will attract more able men, that they will keep their vigor and enthusiasm longer, and that the quality of their teaching will be much improved.

By the establishment and equipment of this building, Acadia is lending a helping hand toward the fulfillment of that promise, whose complete fulfillment we shall never see on this earth but toward which we are constantly making progress: "Ye shall know the truth and the truth shall make you free."

H. A. Bumstead
Yale University

The Carnegie Foundation and its Service Pensions

The announcement of the Carnegie Foundation that it is the intention to limit retiring allowances on the basis of a twenty-five years' service to cases of disability, has brought dismay and surprise both to those directly interested and to the larger public to whom academic interests are of concern. The report of the foundation stating this action and its reasons is now available; and the propriety as well as the wisdom of the change in rules may be discussed.[1]

There are three issues involved: whether the reasons given for the abandonment of one of the two fundamental provisions of the foundation are adequate, legitimate and convincing; whether independently of its desirability the abandonment of the original plan is made necessary by financial reasons; whether the sudden withdrawal from the obligations which the foundation has assumed is just.

The practical importance of the last issue entitles it to first place in the immediate situation; and on this matter it is possible

[1] Since the situation requires a certain freedom of expression, I may be permitted to explain that I have publicly and privately expressed the most cordial approval of the foundation, its purposes and its provisions, particularly and above all of the provision which is now to be withdrawn. Articles in the *Dial* will sufficiently indicate this fact. An article in the *North American Review* will further indicate the high opinion I formed of the influence of the foundation and of the necessity of including the state universities in order that this influence shall be of national scope. This commendation must stand as evidence of my interest and favorable attitude towards the foundation and its mission.

to let others speak. Professor Lovejoy[2] draws attention to the ethical obligations involved toward those men who very naturally were looking forward in the immediate future to a retirement under the provision so unexpectedly withdrawn. It must be evident that the expectations thus aroused carry with them every essential factor of an implied contract. The withdrawal of this right affects at once a group of men who were looking forward to taking advantage of its arrangements within the next five or ten years, and affects them in a manner so particularly unfortunate that they need not hesitate to refer to this personal aspect of the situation. But the yet more serious side of this sudden withdrawal is that it reflects so unfavorably upon the foundation itself. One of the prominent arguments used by the foundation in establishing its provisions was that the professor could look far ahead and with *absolute security* to the benefit thus to be conferred. An institution that radically changes the essential scope of its purpose within four years is not suggestive of security. It will be extremely difficult, even if the present problem is reconsidered and more satisfactorily solved, to assure professors that other provisions will not be withdrawn and with no more convincing reasons. Nor can any refuge be taken in the fact that the foundation reserved to itself the power to change its rules. Every reasonable understanding of that proviso would interpret it to refer to minor changes in administration, not to a radical and far-reaching abandonment of a distinct and explicit provision. On this point the *Evening Post,* of February 28, leaves nothing to be said, unless it be to indicate that Professor Lovejoy does not stand alone in his fear that "a body which at a moment's notice abandons one of the two purposes constituting its proclaimed *raison d'être* is equally likely to modify the other to any assignable degree." The editorial concludes thus:

> Dr. Pritchett says that "the expectation that this rule would be taken advantage of almost wholly on the ground of disabilities has proved to be ill-founded"; but if this is meant as a defence against the charge of want of good faith, it betrays a misty notion of the nature of moral obligations. If disability was meant to be the basis from the beginning, nothing would have been easier than to say so; if it was not, then it was absolutely honorable, right and proper for any man to avail himself of the retiring allowance offered him without reference to any question of disability. If an error was made in the first place, rectify it by all means; but first stand by the consequences of your error, to the extent demanded by the ordinary standards of honorable conduct between man and man. An absolutely essential requirement of a properly constituted university pension system is that it shall not place upon the professor any sense of obligation other than what is inevitable and inherent in such a system; he must feel that he has earned his pension, just as he has earned his salary, by his past services. If to retire under a pension is to mean to retire under a censorship, the Carnegie Foundation may conduce to the material comfort, but will certainly not conduce to the dignity or the self-respect of the profession of university teaching. And, to come back to the main point, the homely obligation of fulfilling in a reasonable measure substantial expectations that have been raised by one's own declared intentions is a duty antecedent even to the high purposes to which the Carnegie Foundation is dedicated.

The immediate object of endeavor may well be to bring to the attention of the trustees, in as convincing a manner as possible, the categorical imperative of the obligation which they have assumed. There is much to be said for the view that this obligation extends to all institutions that have already become accredited to the foundation. But moral obligations are not incompatible with a reasonable regard for the practical situation. If the foundation could be prevailed upon to adopt in place of the measure now upon its records, an

[2] *Nation,* February 3.

announcement that unless the financial and other conditions are decidedly altered, the foundation will find it advisable to withdraw (except in cases of disability and such other cases as may be specified) the right of an allowance on the service basis, after the year 1915 or 1920, it may be confidently expected that the academic world will accept this announcement with deep regret, but without that feeling of righteous indignation or moral resentment which is so forcibly expressed by the writer of the editorial just cited. The first and paramount obligation is for the foundation to clear its record and restore confidence in the value of its mission, in the directness of its methods, and the unquestioned acceptance of its obligations. A ten-year period is none too long for such an announcement; for it may well be that with the situation clearly foreseen, measures may be taken to continue the service retirement upon some modified basis which will tend to the advancement of the profession, and to the retention of the influence of the foundation.

To proceed to the consideration of the situation as it stands: The report shows that as yet only one fourth of the funds for retirement allowances is expended for service grants, while three fourths of the funds go for age grants. It appears that this is regarded as a large ratio; but that depends upon how one views the desirability and the value of service allowances. One who believes strongly in the value of such allowances will hold that to them might properly (in an experience of twenty to thirty years) be assigned the larger rather than the smaller share of the funds. But the argument advanced by the report expresses dissatisfaction with the working of this retirement provision for the following reasons, and concludes that the service pension for professors is a mistake: First, that universities are likely to bring undue pressure to bear to retire professors who are willing and should be permitted to continue their service. Second, that there will arise a "tendency of the teacher assured of a retiring allowance to become ultra-critical toward the administration." Third, that the hope that such allowances would prove an aid to research is one which on the whole seems illusive. Fourth, that too many men accept the allowance because they are tired of teaching, or wish to go into business, or to engage in some activity irrelevant to the purpose of the foundation. "It seems that this rule offers too large a temptation to certain qualities of universal human nature"—but yet, if universal, why were they not considered three or four years ago? Fifth, that of forty men retired on this basis, only twelve retired for disability. This is regarded as a disproportion, although there is nothing in the original provision which suggests that the main purpose of the rule was to provide for cases of disability. Sixth, while there is no explicit statement that this is a cause for the action, the conclusion may be inferred that a continuance of this policy would overtax the available funds.

To the first it might be replied that if the universities so offend, the foundation should withdraw the right of retirement by the universities until they can show good cause for their actions; to the second, that the sin of being critical towards the administration is a form of *lêse majesté* not likely to be seriously regarded in a professedly democratic community, at all events not so seriously as to cancel a right (?) to a pension; to the third, that it all depends upon what manner of men occupy professorial chairs, and that the purpose of the foundation is to so improve conditions that the right type of men may more readily be induced to enter this career; to the fourth, that the needlessly severe conditions of the

academic life are more responsible for this situation than the "human nature" of the professors; to the fifth, that it is rather complimentary to the physique of the teaching profession that more have not qualified for the privilege of disability—or are those who succumbed the unhonored martyrs who are not even a burden to the Carnegie Foundation?; to the sixth, that foresight in not promising what can not be fulfilled is demanded of every business-like institution.

But it is obvious that in reality too many questions are involved in this issue to make it possible, or in the present connection desirable, to consider them in detail. It is sufficient to call attention to the fact that every system, however worthy or wise, is open to abuse; but the abuse must be very considerable and extended before it justifies so drastic a cure. It must be remembered that in every transition from one system to another, there necessarily follows a period of adjustment, and that the value of the provision can be decided not by its abuses but by its uses, and that only after the academic career in this country has become adjusted to the Carnegie provisions. It would seem to be much fairer to wait twenty years and see what men actually do who withdraw under this provision, before deciding that it is a mistake. In brief, the question as to how far this provision of the foundation is a mistake can not at this stage be decided by the experience obtained, but must be appraised according to the value attached to this method of advancing the attractiveness of the academic career. This is so wholly a matter of opinion that there is little to be gained by opposing one opinion to another; but it should be pointed out that at least one member of the board of trustees of the foundation, President Jordan, has taken a very opposite view, and tells the public that "the retirement of men in good health to pursue their studies unhampered may be regarded as one of the most important functions of the Carnegie Foundation." If what is regarded on the one hand as a mistake is regarded on the other as a most important function, this conflict of view is sufficient to make one pause before justifying so radical a step by so questionable a consideration.

But at this point it becomes quite impossible to avoid the reflection that the actual considerations are really the financial ones, and that the reasons given would of themselves (without the financial difficulty) have seemed quite inadequate to many who participated in the decision. This reflection is again a very serious one. If the provision had to be abandoned for financial considerations, that fact should have been stated prominently, frankly and without complication with other reasons.[3] All universities are so troubled by a lack of funds that such a statement would at once seem natural and in an academic community would command full sympathy. And so again if this provision is not a mistake, but merely another instance in which a high and far-reaching ideal has to be given up for a more limited range of service, that is likewise a very familiar academic situation with which every one

[3] In regard to the financial side, it may be recalled that in Mr. Carnegie's original letter giving ten million dollars for the foundation, it was said that "expert calculation shows that the revenue will be ample for the purpose." If this calculation, however expert, has proved to be a mistake, it is that mistake which most needs acknowledgment. At the same time it should be understood that the load of the service allowance is not wholly an additional burden upon the foundation, since with the ordinary expectation of life some of those who retire on the less favorable basis but near to the age of sixty-five will draw no more from the foundation than if they retired upon the more favorable basis a few years later.

sympathizes. If the provision is a mistake, no one can be expected to make an effort to prevent its withdrawal or to secure larger financial support to make possible its continuance; but if the provision is a most desirable and important function of the foundation, it should be possible to enlist the interest that has already so generously provided these funds to further support the foundation and render it as comprehensively efficient as was originally intended. Here as everywhere in academic administration, it is most essential that the right reasons be stated for the action taken, so that academic interests and financial questions may not be confused.

President Jordan distinctly states that it is the financial difficulty that is largely responsible for the withdrawal of the provision. If this is the case, the responsibility of anticipating this condition four years ago can hardly be avoided; and it becomes difficult to explain how so recently as two years ago an actual extension of the liberality of the retiring provisions was made. Originally the maximum grant was limited to $3,000, but in 1907 this was advanced to $4,000. Now it appears that this change affects on the age basis only those whose salaries range from $5,300 to $7,200, and on the twenty-five-year basis only those whose salaries range from $6,800 to $9,200. It is certainly an unpleasant reflection that almost all those who might be affected by this increased allowance are university presidents, many of them perhaps members of the board that made this decision. Surely if funds were likely to be inadequate, this was hardly the point at which an increased generosity was permissible.

It should be added that there is another factor in the situation, which appears in the instructions to the executive committee, which is directed

> to safeguard the interests of the following classes of cases: (*a*) those who have research work in view and have shown themselves unmistakably fit to pursue it; (*b*) those whose twenty-five years of service include service as a college president; and, (*c*) those in whose mind a definite expectation has been created by official action that they will be accorded the benefits of the foundation within the year 1910.

These instructions appear in President Jordan's letter; and it is at least a slight consolation to be informed through his letter that there is no intention to enforce the rule retroactively for the present year. The change in the rules consequent upon these instructions indicates that in spite of the withdrawal of the service allowance the trustees are willing to grant an allowance "to the rare professor whose proved ability to research promises a fruitful contribution to the advancement of knowledge, if he were able to devote his entire time to study or research; and the trustees may also grant [a similar allowance] to the executive head of an institution who has displayed distinguished ability as a teacher and educational administrator." This censorship by the foundation of the merits of applicants clearly destroys the initial policy of the foundation which gave to the professor the right of a pension. The pension as a favor, with an emphasis upon that aspect of the academic career least germane to the purposes of the foundation, is a totally different matter from the far-reaching and beneficent policy which brought to the foundation its most cordial supporters. It is peculiarly difficult to understand why a policy which for the professor has proved to be a mistake shall yet be reserved as a privilege for the president; while again, it seems peculiarly invidious to insert the adjective "rare" before the "professor" and omit it in case of the "president."

While I can not agree that the service allowance can within so short an experience

be proved to be a mistake, I believe that there is one factor in the constitution of the foundation that this brief experience proves to be a mistake. I refer to the absence from its board of trustees of a number of men who can and will safeguard, as well as express and understand, the interests of the professors. Presidents can, if they will, do this in part; but they can not fully represent the academic and the administrative interests (both fully justified) at once. Is it not a fair presumption that if half of the members of the board had been university professors, the precipitate withdrawal of the service provision—not to say the indefensible repudiation of obligations presently to mature—would have been avoided?

And so I ask whether it would not be well for the foundation to collect opinions upon the desirability of service allowances and have them brought before the trustees. If it shall prove that a considerable number agree with President Jordan, it is to be hoped that measures will be taken to secure for the foundation the exercise of this important service. I may repeat in this connection a proposal that was suggested years ago, that the universities themselves be required to provide part of the funds for retiring allowances; that at the outset they should have been asked to consent to a contingent provision that if at any time the service allowance proves to be too heavy a tax upon the foundation, the universities shall carry the load until the men reach the age of sixty-five; or equally it might have been urged that it is a greater privilege for the foundation to provide the allowance after twenty-five years' service and let the universities carry the age provision. I may also be permitted to say that from the outset it seemed to me that quite the wisest provision to really advance the academic profession was to have made possible a system of half retirement, upon which men after twenty-five years of service shall be relieved of most of their teaching, while yet they give to the university the influence of their presence, their reputation and their ripe scholarship.

Not alone has the foundation without notice withdrawn a portion of its program of most vital concern to the academic profession, but the official channel of its expression announces that the change thus decided upon "will command the approval of the great body of devoted and able teachers and is in accordance with the spirit of the rules as originally framed." For my part, I have no choice but to incur the odium of exclusion from this approval and content myself with showing what modest devotion or ability I may possess in other directions, in order to retain my right of protest that the change itself (whether enforced or not) is most regrettable, and that there is nothing in the spirit of the original rules that foreshadows the interpretation that has now been made. It is pertinent to recall that a point of great emphasis in the original provisions is that the right to a retiring allowance shall come to the professor undisputed and as a result of his own initiative. It was this feature that brought the largest commendation to the foundation and that was instrumental in inducing institutions that already had a pension system to give it up in favor of the Carnegie provisions. There were many who four years ago predicted that in spite of this provision the fund would be administered as a semi-charitable old-age pension fund. To this objection it was then possible to reply that the twenty-five years retirement allowance distinctly gave to the professor some control of the use of the allowance in a dignified manner and to serve the cause of education. If this provision is abandoned, it is not quite obvious how one

is to reply to the view that incapacity and old age are suggestive of charity and not of the advancement of the teaching profession. As one who is interested in the causes which the foundation was instituted to promote, I can not look with equanimity upon the curtailment of the influence of the foundation as now proposed, and I am willing to risk the confusion of personal interest with a disinterested view of the benefit to the teaching profession in order that the question may be seen as a whole and not decided abruptly by mere temporary expediency.

Two obligations seem to rest upon the foundation in order to reinstate its influence and to justify its mission. In an unequivocal and equally in a generous manner it must meet the obligations which its announcements have aroused in the minds of those who within a few years will be in a position to take advantage of its formulated provisions; and in the second place, to reinstate confidence in its methods, there should be a plain statement to the effect that the financial difficulty is or is not the determining cause of the present action. If such prove to be the case, let the arguments against a system be held in reserve, and let the actual situation be met in that same helpful spirit which has characterized so many of its important and beneficial decisions.

Joseph Jastrow

Columbia University,
March 2, 1910

An American Research Institution in Palestine. The Jewish Agricultural Experiment Station at Haifa

A new American institute of research has just been incorporated in New York under the title of the "Jewish Agricultural Experiment Station," with a board of trustees composed of Mr. Jul. Rosenwald (Chicago), president, Mr. Paul M. Warburg (New York), treasurer, Miss Henrietta Szold (New York), secretary and Dr. Cyrus Adler (Philadelphia), Mr. Sam S. Fels (Philadelphia), Judge Jul. W. Mack (Chicago), Dr. J. L. Magnes, Mr. Louis Marshall, Dr. Morris Loeb, Mr. J. B. Greenhut (New York) and Dr. O. Warburg (Berlin, Germany), members of the board.

This new experiment station is to be located at the foot of Mt. Carmel in Palestine, seven miles from Haifa, and is the first agricultural institution of research supported by private American capital to be established in a foreign country. The funds for the station have been furnished by several philanthropic Jews. Messrs. Jacob H. Schiff, of New York and Jul. Rosenwald, of Chicago, have furnished the first $20,000 necessary for the initial equipment. The minimum budget of $10,000 a year has been assured by Messrs. Schiff and Rosenwald, together with Mr. Paul M. Warburg (of Kühn, Loeb & Co.), Mr. Is. N. Seligman, Mr. Isidor Straus and others.

As an American institution in the Levant and carrying the American experiment station idea abroad, this newly incorporated institution can not fail to interest American experiment station workers, since its purposes are the scientific study and development of the agricultural resources of one of the oldest parts of the old world, as rich in latent wealth as it is in historical and religious interest.

The director of this new station, Mr. Aaron Aaronsohn, is already known to quite a circle of experiment station workers, having spent a number of months in making comparative studies of the agricultural, climatic and botanical conditions of our southwestern country, for the purpose of comparing them with present conditions in Palestine, in which studies he has been deeply impressed with the remarkably close agricultural resemblance existing between California and Palestine. Mr. Aaronsohn is peculiarly well equipped to establish such an institution in Palestine, having spent fourteen years of his life in agricultural and botanical explorations throughout that region and having made himself familiar with Turkish, Arabic and

Hebrew, as well as French, German and English. He is a graduate of the Agricultural School of Grignon, France, and has attracted the attention of the scientific world through his discovery of the long-sought wild prototype of wheat. His discoveries in Palestine of drought-resistant stocks and dry land grains and forage plants, as well as the possibilities of American breeders utilizing his wild wheat, have led Dr. Galloway, the Chief of the Bureau of Plant Industry, to request Mr. Aaronsohn to prepare a bulletin, which is now in print, giving in some detail the bearing of his studies in Palestine on the many agricultural problems of the United States.

While the special aim of the institution will be to put the Jewish colonists and farmers of Palestine and the neighboring colonies in a position to carry on agriculture in a rational and progressive manner, Mr. Aaronsohn's idea is to assemble as complete an equipment of the official agricultural publications of the United States as possible. Through the liberality of the Office of Experiment Stations and the directors of various state stations, supplemented by private gifts and purchases, Mr. Aaronsohn has already assembled what will be the most complete set of American experiment station reports and bulletins to be found anywhere in the Old World. It is his earnest desire to make this set of American experiment station reports absolutely complete and he will keenly appreciate any help given him towards this end.

As the study of plant pathology is quite unknown in Palestine, Mr. Aaronsohn has purchased as a nucleus of pathological work the collection of the late Professor W. A. Kellerman of about 24,000 specimens of fungi, and the Department of Agriculture has offered to supplement this with about a thousand other numbers. To these American numbers Mr. Aaronsohn proposes to add his own personal collections of agronomic, botanical and geological material, and altogether they will prove of invaluable assistance in the comparative studies which he proposes shall be carried on at the station.

The buildings will be of stone and practically fireproof, but to give further guaranty against loss Mr. Aaronsohn proposes to install steel shelving for the books and metallic cases for his collections.

It is also Mr. Aaronsohn's purpose to have a visitors' laboratory, with proper facilities, which will be placed at the disposal of properly accredited visitors from abroad. Those who have taken advantage of the marvelous facilities of the Naples Zoological Station will appreciate how much this means in a country like Palestine, where there are few facilities for scientific investigation.

It is Mr. Aaronsohn's intention to publish at least the annual reports of his station in English, although naturally his circulars and bulletins containing the practical results will for the most part be published in Hebrew, Turkish and Arabic.

The founding with liberal financial support of this new station in the eastern Mediterranean region will go far towards introducing American methods in the study of agricultural problems throughout the whole Mediterranean region and facilitate the exchange of plant industries between that region and the United States, which has been already begun by the agricultural explorers of the department, and by such men as Dr. L. Trabut, the government botanist of Algeria, and which has proved of such mutual aid to both regions.

DAVID FAIRCHILD
U. S. DEPARTMENT OF AGRICULTURE

THE CARNEGIE INSTITUTION OF WASHINGTON[1]

THE Carnegie Institution of Washington has just issued its eighth "Year Book," a volume of about 250 pages, containing a résumé of the work accomplished under the auspices of the institution during the year 1909. The "Year Book" comprises the annual reports of the president, the executive committee and the directors of various departments of research, together with reports upon the progress of other investigations carried on by individual grantees and associates of the institution. There is also included a

[1] Statement supplied by the Institution.

bibliography of papers and reports on these investigations which have appeared in various journals during the year.

The report of the president gives detailed figures showing the funds available for expenditure during the year and the manner in which these funds have been distributed. A summary of these financial statements shows that of the $694,094.11 available, $467,500 have been applied to the maintenance of large projects and established departments of work; $49,969.32 have been distributed in the form of minor grants to individuals; $30,575.02 have been allotted to research associates and assistants; $54,645.27 have been expended in the work of publication and $49,792.21 have been required for administrative purposes. These allotments reached a total of $652,-481.82, leaving an unallotted balance of $41,-612.29 at the close of the fiscal year. The total amount of funds appropriated for expenditure from the foundation of the institution to the present time is $4,320,140.00, of which $307,227.03 were reverted and afterwards reappropriated. The total amount expended to date is $4,128,697.11.

The scope of the work undertaken by the institution has broadened until, as shown by the present report, investigations have been carried on in more than thirty different fields of research and extended into more than forty different countries. Two astronomical observatories and five laboratories are maintained, and the equipment of the various establishments located in different parts of the United States includes 58 buildings, a specially designed ship and 8 smaller craft.

The building designed for the principal offices of the institution has been completed during the past year and has been occupied by the administrative staff since the second week in November. It is located at the corner of Sixteenth and P Streets, in Washington, and contains, in addition to the executive offices, an assembly room with a seating capacity of 200 and ample space for the storage of publications. The annual meetings of the board of trustees will be held here, as well as the monthly meetings of the executive committee of the institution.

The building was dedicated on December 13, when addresses were delivered by Mr. Andrew Carnegie, founder of the institution and Hon. Elihu Root, chairman of the building committee. On this occasion also an illustrated lecture was given by Dr. George E. Hale, director of the Solar Observatory located on Mount Wilson, California, inaugurating a series of lectures which it is proposed to give annually. From December 15 to 17 the building was open to the public for inspection, and exhibits from the investigations of the ten departments of research, together with the work of publication and administration, were placed on view.

As a notable event of the past year the president cites the establishment and active operation of the observatory of the Department of Meridian Astrometry, at San Luis, in Argentina, under the direction of Professor Lewis Boss. The work of observation of the southern stars was begun in April last, and is now proceeding at a rate heretofore unequaled in this branch of astronomy. Observations made with the meridian-circle, transferred with great care to San Luis from the Dudley Observatory, in Albany, New York, will be combined with corresponding observations made at Albany.

Another event of prime importance during the year has been the completion and the initial cruise of the nonmagnetic ship *Carnegie*, now making a magnetic survey of the Atlantic Ocean, under the direction of the department of terrestrial magnetism. This ship was launched on June 12, 1909, and set sail upon her first voyage on August 21 last. During her voyage across the Atlantic errors of prime importance to navigation were found in the best magnetic charts now used by mariners.

At the Solar Observatory in California the 60-inch equatorial reflecting telescope has been tested and found highly satisfactory. The construction of a new tower telescope, 150 feet high above ground and 75 feet below ground, has been begun. In addition to the further interpretation of the nature of sunspots, it is expected that an investigation of the electro-magnetic properties shown by the

sun, in conjunction with observations made by the department of terrestrial magnetism on "storms" to which the earth's magnetism is subject, will result in a distinct advance in this field of research.

Capital results have been achieved also during the past year by other departments of the institution. At the Geophysical Laboratory in Washington, where geological and mineralogical experiments are being carried on, there has been an important addition to the equipment in the form of apparatus for subjecting materials under observation to high pressures and high temperatures. At the Marine Biological Laboratory at Tortugas, Florida, research has been widely extended by a corps of specialists. The equipment of the Nutrition Laboratory in Boston has proved highly effective in ascertaining the influence of nutrition upon pathological as well as upon normal subjects. The search for the sources of American history, which is being conducted by the department of historical research, has been vigorously carried forward in Mexico, Italy, France, Germany, Great Britain and the United States.

The investigations of the department of botanical research have been continued successfully. Among these the experiments of the director in the production of mutants in plants seem destined to play a fundamental rôle in the determination of the absorbing biological question of the derivation of species. The progress made in the researches in experimental evolution being conducted at Cold Spring Harbor has also been significant, and the facilities of this department have been increased by the purchase of Goose Island, in Long Island Sound, where the development of plants and animals in a state of isolation may be observed.

The publication work of the institution has proceeded actively. Nineteen volumes, with an aggregate of 4,907 pages, have been issued, bringing the total number of the institution's publications to 141, with a total aggregate of approximately 35,000 pages of printed matter. One of the most important publication projects thus far undertaken by the institution was inaugurated during the year, namely, that of an addition of the Classics of International Law. Under the general editorship of Professor James Brown Scott, the early master-works in international law are to be issued. Each work is to be reproduced by photographic process from the best available edition, and accompanied by a complete translation into English, and supplied with an introductory commentary. The work already begun includes the "Juris et judicii fecialis, sive juris inter gentes" of Zouche, and the "De jure belli ac pacis" of Grotius.

THE ROCKEFELLER FOUNDATION

As readers of SCIENCE have learned from the daily papers, a bill has been introduced into the United States Senate incorporating the Rockefeller Foundation, the object of which is "to promote the well-being and advance the civilization of the peoples of the United States and its territories and possessions, and of foreign lands, in the acquisition and dissemination of knowledge, in the prevention of suffering and in the promotion of any and all the elements of human progress." The bill names as incorporators of the foundation John D. Rockefeller, John D. Rockefeller, Jr., Fred T. Gates, Starr J. Murphy and Charles O. Heydt. The principal offices of the foundation would be in the District of Columbia, though the bill also gives the right to establish branch offices elsewhere and to hold meetings of the trustees at any place they may see fit. The amount of the endowment has not been announced. It is said that Mr. Rockefeller's gifts have amounted to about $150,000,000, and that his present fortune is in the neighborhood of $300,000,000.

SCIENTIFIC NOTES AND NEWS

DR. ADOLF VON BAEYER, professor of chemistry at Munich, has been elected a foreign member of the Paris Academy of Sciences.

THE following fifteen candidates have been selected by the council of the Royal Society to be recommended for election into the society: Mr. J. Barcroft, Professor G. C. Bourne, Professor A. P. Coleman, Dr. F. A. Dixey, Dr. L. N. G. Filon, Mr. A. Fowler, Dr. A. E. Garrod,

Mr. G. H. Hardy, Dr. J. A. Harker, Professor J. T. Hewitt, Professor B. Hopkinson, Dr. A. Lapworth, Lieutenant-Colonel Sir W. B. Lieshman, Mr. H. G. Plimmer, Mr. F. Soddy.

Professor G. E. Hale, Professor S. Arrhenius and Madame Curie have been elected honorary fellows of the Physical Society, London.

Dr. Hugo Münsterberg, professor of psychology at Harvard University, has been appointed exchange professor to lecture at Berlin in 1910–11.

The Academy of Scientific Men of Halle has awarded its gold Cothenius medal to Dr. Wilhelm Pfeffer, professor of botany at Leipzig.

The New York Academy of Sciences has appointed the following delegates to represent it at international congresses during the coming summer: Professors Hermon C. Bumpus, Bashford Dean and Henry E. Crampton for the Zoological Congress at Graz; Professors James F. Kemp, J. J. Stevenson and Dr. E. O. Hovey for the Geological Congress at Stockholm.

Professor Punnett, Mr. H. Gadow, King's, and Mr. A. E. Shipley, Christ's, have been appointed representatives of Cambridge University at the International Congress of Zoology to be held at Graz in August next. Mr. A. G. Tansley, Trinity, has been appointed to represent the university at the International Congress of Botany to be held at Brussels in May next.

Sir J. J. Thomson has been nominated to represent Cambridge University at the celebration next October of the centenary of the University of Berlin.

Sir William Preece, Sir Joseph Swan and Professor G. Vernon Harcourt have been elected the first honorary members of the Illuminating Engineering Society.

Dr. A. Hertzfeld, director of the Institute of Sugar Industry in Berlin, has been elected a foreign member of the Swedish Academy for Agriculture.

Dr. Edm. von Lippmann, Halle, has been given the honorary degree of doctor of engineering by the Dresden Institute of Technology.

The naturalists of France and of many other parts of the world are uniting in a jubilee celebration in honor of J. H. Fabre, styled by Charles Darwin "the immortal Fabre," and referred to by him also as "that inimitable observer." Fabre, after years of labor and of patient observation and of most important work, is, in his age, the most modest of men, leading a retired life, and his admirers everywhere and in all walks are uniting in this celebration. Not only are naturalists coming together for this jubilee, but prominent officials throughout France and prominent men in literature as well, since Fabre's published work possesses a high literary value. No one, says David Sharp, has ever written on his subjects with equal brilliancy and vivacity. So Mistral, the poet; Edmund Rostrand, the poet and dramatist, and Maurice Materlink, the naturalist, philosopher and novelist, among others, have united in this jubilee. Members of the French Academy engaged in other branches of science, such as Poincaré, and men prominent in many walks of life, not even excepting journalism, such as Hèbrard, the director of the *Temps*, have also associated themselves with Fabre's other admirers. The jubilee will be held on the third of April, at the time of the inauguration of the Institute of Oceanography by the Prince of Monaco. A medal will be struck in honor of the occasion. Americans wishing to contribute may send their subscriptions to Dr. L. O. Howard, permanent secretary of the American Association for the Advancement of Science, Smithsonian Institution, Washington, D. C. These should be sent at once, since the subscription closes the twenty-fifth of March.

Since the return of the DeMilhau Peabody Museum South American Expedition of Harvard University, Dr. William C. Farabee has received from the Universidad Mayor de San Marcos de Lima a diploma as honorary member of the faculty of sciences in the university, for "scientific merits and important services rendered to the government of Peru."

DR. J. K. SMALL, head curator of the museums and herbarium of the New York Botanical Garden and Mr. J. J. Carter, of Pleasant Grove, Pennsylvania, have spent about four weeks in botanical exploration of the unknown interior of the Andros Islands, thus completing the botanical survey of the Bahamian archipelago.

DR. J. E. MOORE, professor of surgery in the University of Minnesota, was seriously injured on February 25 by the fall of the temporary roof in the building where he was conducting a class in surgery. It is expected that he will recover. Nine students were more or less seriously injured.

THE New York alumni of the Johns Hopkins University held their annual dinner on March 2, when Dr. Simon Flexner, director of the Rockefeller Institute of Medical Research, presided.

PROFESSOR JAMES H. TUFTS, of the University of Chicago, will deliver a series of ten lectures on "Present Problems in Metaphysics and the Theory of Knowledge," before the department of philosophy, psychology and education of the Johns Hopkins University, March 9–19.

DR. W. S. FRANKLIN, professor of physics at Lehigh University, lectured before the Middletown Scientific Association of Wesleyan University on the "Practical Applications of the Gyrostat."

MR. F. W. DARLINGTON, of Pittsburgh, Pa., lectured before the electrical engineering students at the University of Minnesota on February 23 on "The Electrification of Steam Railways."

THE first discourse given on the new foundation of the Halley lecture at Oxford University will be delivered by the founder, Dr. Henry Wilde, F.R.S.

A TABLET in memory of Ross Gilmore Marvin, who was drowned in the Arctic Ocean on the Peary Polar expedition, will be unveiled in Sage Chapel, Cornell University, next month. Commander Peary will give the memorial address.

FOREIGN papers state that the inhabitants of Gross-Lichterfelde, the native place of Otto Lilienthal, have decided to erect a monument to the memory of their countryman, who was amongst the earliest practical pioneers in aviation, and met his death in 1896 while making a flight at Gömberg, in the province of Brandenburg. The monument will be erected either on the hill on the slopes of which Lilienthal made his early experiments, or in the square on the bank of the Teltour Canal.

THE Rev. G. F. Whidborne, known for his work in geology, died on February 14, at the age of sixty-four years.

COLONEL C. F. CONDER, of the British Army, who made important explorations in Palestine, died on February 16.

DR. HENRI DUFOUR, professor of physics at Lausanne, has died at the age of fifty-eight years.

THE following awards of the Mary Kingsley medal have, as we learn from *Nature*, been made by the Liverpool School of Tropical Medicine: Mrs. Pinnock, in recognition of the services rendered to the cause of tropical medicine and sanitation by her brother, the late Sir Alfred Jones, founder and first chairman of the school; Mr. W. Adamson and Professor W. Carter, for assistance rendered in the foundation of the school; Prince Auguste d'Arenberg, president of the Suez Canal Company, for his campaign against malaria at Ismailia; Sir William Macgregor, Governor of Queensland, for his services to sanitation and tropical medicine while governor of Lagos; Surgeon-General Walter Wyman, head of the Marine Hospital Service in the United States, for the organization which he has given to the service under him and for the manner in which he has always supported scientific principles in public sanitation; Sir Alfred Keogh, recently Director-General of the Royal Army Medical Corps, for the organization which he has given to the service under him and for the manner in which he has always supported scientific principles in public sanitation. The medal for valuable contributions to the scientific and educational side of tropical medicine has been awarded to Pro-

fessor R. Blanchard, Paris; Dr. A. Breinl, director of the Tropical Diseases Institute in Queensland; Professor A. Celli, Rome; Dr. C. W. Daniels, director of the London School of Tropical Medicine; Surgeon-Colonel King, Indian Medical Service; Professor Nocht, director of the Hamburg School of Tropical Medicine; Professor G. H. F. Nuttall, Quick professor of parasitology at Cambridge University; Major L. Rogers, Indian Medical Service; Professor J. L. Todd, associate professor of parasitology at McGill University.

From statistics published in the German press, giving for European countries the number of dirigible balloons and aeroplanes already finished at the end of 1909, or which will be ready for use very shortly, Consul Carl Bailey Hurst, of Plauen, quotes the following: Germany possesses 14 dirigibles of six different models—namely, Gross, Zeppelin, Parseval, Schütte, Siemens-Schuckert and the Rhine-Westphalian air ship—and five aeroplanes. France has seven dirigibles and 29 aeroplanes; Italy, three dirigibles and seven aeroplanes; Russia, three dirigibles and six aeroplanes; Austria, two dirigibles and four aeroplanes; England, two dirigibles and two aeroplanes, and Spain, one dirigible and three aeroplanes. Altogether, European nations have 32 dirigibles and 56 aeroplanes that are presumed to be available for service.

The enterprise of German foresters and the importance of tree planting for forest purposes are shown by two items of news which come, the one from Montana, the other from Ontario. It is reported that a demand has developed for Montana larch seeds to be used by German nurserymen; while white pine seedlings are to be imported from Germany by the town of Guelph, Ont., for planting a 168-acre tract of land belonging to the municipality. The Germans recognize that the introduction into their forests of valuable trees native to other countries may be to their advantage. Although as a rule the forest trees best adapted to each region are those which naturally grow in it, there are many exceptions. Norway spruce and Austrian and Scotch pine have been carried from their native home to other parts of Europe and to America and have been found well worth the attention of the grower of timber. Several of our own species have met with favor in Europe and flourished there, such as the Douglas fir, black walnut and others. The Australian eucalyptus is proving a great find for America and South Africa. Our own white pine long ago crossed the Atlantic in response to the needs of Europeans, whose forests are comparatively poor in tree species, and is now grown commercially on such a scale that when it is wanted for planting in its own native habitat the German nurseryman is often ready to deliver young plants here for a lower price than our own nurserymen will quote. Now the Germans are going to try the Western larch also. The request from the German nurseryman instructs the collectors to gather the choisest seeds when ripe this fall. One nurseryman on Flathead Lake has offered to exchange larch seeds for seeds of desirable German shrubs, which he intends to cultivate and sell in America. In the same region, four or five months ago, foresters of our Department of Agriculture gathered seed for use in the neighboring Lolo Forest, where a new forest-planting nursery was begun last year. The objects of the Guelph planting are, according to local accounts, to protect the town's water source by a forest cover over its springs in the hills, to make a beautiful woods for a public park and to provide for a future timber supply as a municipal asset. In foreign countries, forest tracts are often owned and managed by towns and cities as a paying investment and to insure a permanent supply of wood for local consumption, but in America planting by municipalities other than for parks and for watershed protection has scarcely been thought of. The kinds of trees to be grown in the Guelph park have already been decided upon by the Ontario Agricultural College. The proposed reforestation promises to be of so great economic and sanitary value that the estimated cost of $8 per acre for importing

and planting the seedlings and caring for the growing trees is regarded as well worth while.

WE learn from *Nature* that the late Mr. R. Marcus Gunn, the eminent ophthalmic surgeon, who devoted much of the leisure of his vacations to making a collection of fossils, has left them to the British Museum (Natural History). He worked especially in the Jurassic formations of Sutherland, and at the time of his death was engaged in the preparation of a memoir on the Jurassic flora of Brora, in collaboration with Professor A. C. Seward, who is now completing the undertaking. He obtained many fish-remains, Mollusca and other fossils, which form a valuable addition to the national collection. Mr. Gunn also collected from the Old Red Sandstone of Caithness, and will always be remembered for his discovery of the problematical fossil fish *Palæspondylus gunni,* which was named after him by Dr. Traquair.

UNIVERSITY AND EDUCATIONAL NEWS

TUFTS COLLEGE has been made the residuary legatee under the will of John Everett Smith, and will, it is said, receive on the death of Mrs. Smith the sum of $500,000.

CHARLES ALFRED HASBROUCK, a well-known civil engineer, who died in California on February 1, bequeathed to Cornell University, from which he graduated in 1884, the farm at Forest Home, near Ithaca, on which he was born. His bequest to the university was made as a memorial to his wife, Mary Fobes Hasbrouck. In his will he expressed a wish that the property be used for the benefit of the women students of the university.

THE corporation and the board of overseers of Harvard University have created the department of university extension, and appointed in it the following officers: Dean, Professor Ropes; members of the administrative board for 1909–10, Professor Ropes, Professor Royce, Professor Hanus, Professor Hart, Professor Moore, Professor Osterhout, Professor Hughes and Professor Munro.

IT is announced that extension teaching on a large scale will be undertaken next year by Columbia University. The field to be covered will be broad. There will be classes organized in languages, literature, history, economics and politics; in various scientific subjects, including electrical and mechanical engineering; in architecture; in music and fine arts; in preventive medicine and sanitary science; in manual training and the household arts; in teaching, and in law. For this work a large staff of professors and lecturers will be appointed, chosen in part from the present teaching staff of the university. Professor James Chidester Egbert, director of the summer session, has been appointed director of extension teaching.

THE faculty of the University of Minnesota has inaugurated a movement to secure the erection of a suitable tribute from the people of the state of Minnesota to President Cyrus Northrop. It was decided that the tribute should take the form of a men's building to be erected upon the campus at a cost of not less than $400,000.

THE new recitation hall of Eastern College at Manassas, Va., erected at a cost of $35,000, was dedicated on February 22. Addresses were made by Dr. Elmer E. Brown, U. S. Commissioner of Education, Congressman Jones, of Virginia, and Dr. Hervin U. Roop, the president of the college.

PROFESSOR JOHN S. SHEARER, of the department of physics of Cornell university, is acting as a member of the Columbia University faculty during the rest of the present college year. Professor Wm. H. Hallock, head of the department of physics of Columbia University, will spend the period in Europe.

DR. LOUIS T. MORE, professor of physics, has been elected dean of the College of Liberal Arts of the University of Cincinnati.

MR. FRANK M. LEAVITT, now at the head of the department of manual training of the Boston city schools, has been appointed associate professor of industrial education in the School of Education of the University of Chicago.

MR. S. BRODETSKY, bracketted senior wrangler in 1908, has been elected to the Isaac Newton studentship at Cambridge University.

DISCUSSION AND CORRESPONDENCE

THE LENGTH OF SERVICE PENSIONS OF THE CARNEGIE FOUNDATION

Either as cause and effect or as a matter of mere time sequence, the writer has anticipated in this journal the most important actions taken by the trustees of the Carnegie Foundation at their two last annual meetings. There was printed in Science for April 24, 1908, correspondence with the president of the foundation urging that the pensions of widows of professors entitled to retiring allowances should be made a matter of right rather than a matter of optional favor, and at the meeting of the trustees in November this was done. It seems that this subject is not treated clearly by the president in his last annual report. Referring to the first adoption of the rules of the foundation he says:

> The underlying principles which seemed to be clear were these . . . (5) The retiring allowance system should embrace in its provisions the widows of teachers who under the rules had become eligible to retiring allowances. . . . A third rule provided for the pension for the widow of any teacher who, either on the ground of age or service, was entitled to a retiring allowance. These rules have now been in operation four years.

In the first annual report, however, it was explicitly pointed out that "In all cases, the granting of pensions to widows of professors stands upon a different basis than that of the awarding of retiring allowances to professors," and in the third annual report it is noted that "heretofore the pensions to widows have been only permissory."

I venture to note my service to my colleagues in this direction, as some of them think that I have performed a disservice in pointing out what seemed to me the dangers of the length of service pensions. In Science for April 2, 1909, I wrote:

> The reasons leading to the adoption of retirement after twenty-five years of service are obscure to me unless it is intended to relieve institutions of men whom they do not want to keep. . . . In order to reward a professor after long years of service, he should be relieved not of half of his salary and the privilege of teaching, but of so much routine instruction and administration as interfere with his research. . . . It may on the whole be regarded as fortunate that the Carnegie Foundation has not the means to continue these annuities for length of service. They will, I fear, tend to demoralize both the "humble and ill-compensated" professor and the "conspicuous" and much-tempted president.

My anticipations were soon justified by the troubles at the George Washington University, which retired on the foundation two of its professors against their will in order to save their salaries and because they did not agree with the policies of the administration, and which then was dropped from the list of institutions accepted by the foundation. I was, however, not less surprised than my colleagues to learn that the trustees of the Carnegie Foundation on November 17 had not only abolished the retiring allowance for length of service, but had made their action apply to those to whom the pensions had been promised.

This action would be absolutely incomprehensible if it were based on the grounds alleged by the president in his annual report, which has just now been printed. He does not even remotely refer to the financial inability of the foundation to carry out the obligations it had assumed, but bases his recommendation on the fact that he has unexpectedly discovered that presidents and professors take advantage of the rule, and that its effect is not "good" owing to "the opportunity which is thus opened to bring pressure to bear on the teacher, or by the tendency of the teacher assured of a retiring allowance to become ultra-critical toward the administration." This last clause throws a curious light on the administrative attitude—it would be dangerous to let the professor criticize the administration if thereby he risked losing only half of his salary and not all of it.

President Pritchett says: "The expectation that this rule would be taken advantage of almost wholly on the ground of disabilities has proved to be ill founded." But what warrant had the trustees for this expectation? The act of incorporation states that the object of the foundation is to provide retiring pensions for teachers who "by reason of long and

meritorious service, or by reason of old age, disability or other sufficient reason shall be entitled to the assistance and aid of this corporation." The rule adopted in regard to the first of the two classes of pensions specified in the act of incorporation reads: "Any person who has had a service of twenty-five years as a professor and who is at the time a professor in an accepted institution, shall be entitled to a retiring allowance computed as follows."

The change in the attitude of the president of the foundation has been as sudden as it is complete. In a letter to him, written on March 21, 1908, I said that the wisdom of the length of service pension was doubtful, and in his reply, intended for publication in SCIENCE and printed in the issue of April 24, 1908, he wrote:

> The provision for permitting a retiring allowance to be gained upon length of service seems also to us to add much to the value of the retiring allowance system. Under this provision a professor may, at the end of twenty-five years, retire on a stated proportion of his salary, the proportion increasing with each year of service. It is not likely that many professors will avail themselves of this provision. The man whose heart is in his teaching will not wish to give it up until a much later period. There are, however, teachers to whom this provision will be specially attractive, and that is to those who desire to spend the remainder of their active lives in scholarly research or literary work rather than in teaching. I can imagine no better thing for an institution of learning than to have about it a group of men who are engaged in active research and who are not burdened with the load of teaching which falls to most American teachers. In this way the retiring allowance will contribute directly to research.

Dr. David Starr Jordan, one of the trustees, is much franker than the president. He writes to the *Evening Post* that it seemed "financially impossible" for the foundation to meet the demands made on it under the rule. This is certainly a valid ground for not admitting to its privileges additional institutions or those not yet professors; but according to law resort must be had to the bankruptcy court when financial obligations can not be met. Whether the foundation is liable to those who have been financially injured by the change in the rule is an open question. Probably the only precedent is the case of Professor Capps against the University of Chicago, in which it was decided that a university can not alter its statutes to the financial disadvantage of a professor. It seems that it might be urged that the foundation has made an implicit contract with the professor. To encourage the advancement of teaching it promises certain rewards to those who perform certain services. Those who have performed the services can perhaps recover at law the payment promised. But whatever the legal obligation may be, the moral responsibility is obvious. President Pritchett writes that the "change will command the approval of the great body of devoted and able teachers." When he learns of his extraordinary error, he will, it may be hoped, recommend such modification of the new rule as will be accepted as equitable by those concerned.

The president of the foundation writes: "It is part of the invariable policy of the Carnegie Foundation to place in the hands of those interested in education the fullest details respecting the foundation and its administration." But it is not clear that the foundation has been entirely frank in the present instance. The official statement in regard to the rules signed by the secretary of the board of trustees reads:

> The rules as thus amended provide a retiring allowance for a teacher on two distinct grounds: (1) to a teacher of specified service on reaching the age of sixty-five; (2) to a teacher after twenty-five years of service in case of physical disability.
>
> Although these are the general rules governing retirement, the trustees are nevertheless willing to grant a retiring allowance after the years of service set forth in Rule 1 [Rule 2?] to the rare professor whose proved ability for research promises a fruitful contribution to the advancement of knowledge if he were able to devote his entire time to study or research; and the trustees may also grant a retiring allowance after the years of service set forth in Rule 1 [*sic*] to the executive head of an institution who has displayed distin-

guished ability as a teacher and educational administrator.

Dr. Jordan has printed the actual resolution adopted by the trustees, as follows:

It was also on motion, duly made and seconded, resolved that first, the executive committee be instructed to safeguard the interests of the following classes of cases: (*a*) those who have research work in view and have shown themselves unmistakably fit to pursue it; (*b*) those whose twenty-five years of service includes service as a college president; and (*c*) those in whose mind a definite expectation has been created by official action that they will be accorded the benefits of the foundation within the year 1910; and that, secondly, the executive committee be authorized to formulate regulations in accordance with these instructions.

It is difficult to reconcile the statement under (*a*) with the announcement of the secretary. In the case of (*b*) one can only reconcile the two versions by assuming that the presidents who make up the board believe that there can be no college president who has not "displayed distinguished ability as a teacher and educational administrator." It is not easy to guess a creditable reason for not having made (*c*) public, for it would not be honorable to conceal it in order to save the money due to those who might apply under the resolution if it were known to them.

It is certainly odd that a board of trustees consisting of university and college presidents should increase the maximum pension from $3,000 to $4,000, which can practically only be of advantage to the comparatively highly-salaried president, and should retain the privilege of retiring after twenty-five years, when this is denied to the professors through the financial inability of the foundation. But perhaps they assume that higher education can be best advanced by retiring the president whenever possible.

The lack of foresight and expert knowledge displayed by the president and trustees of the foundation is truly astounding. Mr. Carnegie wrote in his original letter to the trustees:

I have, therefore, transferred to you and your successors, as trustees, $10,000,000, 5 per cent. first mortgage bonds of the United States Steel Corporation, the revenue from which is to provide retiring pensions for the teachers of universities, colleges and technical schools in our country, Canada and Newfoundland under such conditions as you may adopt from time to time. Expert calculation shows that the revenue will be ample for the purpose.

In making his additional gift for tax-supported institutions, he wrote to the president:

I understand from you that if all the state universities should apply and be admitted, five millions more of five per cent. bonds would be required.

As a matter of fact, a million dollars will not support an adequate pension fund in a single large university—Yale already draws $35,000 a year—and if the state universities continue to develop, as at present, and retirement at sixty-five is made obligatory, five million dollars will not permanently suffice for a single university.

The increase in the appropriations of the foundation for pensions this year is $162,815, and the total appropriation for pensions is $466,320. The total income of the foundation last year was $544,355, and the administrative expenses were $53,584.85. After Mr. Carnegie gives the additional five million dollars, the income will soon be exhausted, even though one of the two objects of the foundation, as stated in the act of incorporation, may be abandoned.

J. McKeen Cattell

SCIENTIFIC BOOKS

Food Inspection and Analysis: For the Use of Public Analysts, Health Officers, Sanitary Chemists and Food Economists. By Albert E. Leach, S.B., Chief of the Denver Food and Drug Inspection Laboratory, Bureau of Chemistry, U. S. Department of Agriculture, formerly Chief Analyst of the Massachusetts State Board of Health. Second edition, revised and enlarged. Cloth, $6\frac{5}{8} \times 9\frac{3}{8}$, pp. 954, Fig. 120; Pl. XL. New York, John Wiley & Sons; London, Chapman & Hall, Limited. 1909.

In 1904 the first edition of this book was published, and speedily found acceptance be-

cause of its high values for the purposes for which it was declaredly written. It is not, and does not pretend to be, a student's manual, a cyclopedia of its subject, a manual of the physiology nor of the technology of food. It is rather a compilation of the facts and methods that one of America's most experienced food analysts has found useful in his work and which he has thought might be helpful to others charged with similar responsibilities and encountering like problems. The merit of the work lies particularly in the fact that the compiler is recognized as a man of fair judgment and a critical analyst, who, from long experience, has come fully to realize, on the one hand, the facts that must be ascertained by analysis and the importance of the issues involved, and, on the other hand, the imperative need for the choice of methods capable of yielding safe results within a reasonable time and at such a cost as will make possible the performance of many similar analyses at moderate cost.

Since the publication of the first edition, many changes have arisen in the field covered by the book. The national food and drugs bill and the meat inspection bill of 1906 have become laws, and a large number of the states have established food controls. The number of chemists engaged in the work of food inspection has greatly increased. Under the leadership of the Association of Official Agricultural Chemists, new and improved methods have been devised. From 1903 to 1906, under authorization of congress, the Secretary of Agriculture has proclaimed standards for a large number of the staple foods, and, since the expiration of the specific authorization under which these standards were proclaimed, the Association of Official Agricultural Chemists and the Association of State and National Food and Dairy Departments, comprising in their membership all who are officially charged with the execution of the food laws of America and Canada, have formulated for the guidance of these officials and for public information, additional standards for other staple foods not represented in the proclamations of the Secretary of Agriculture. In the enforcement of the national law, many important regulations have been published. Meanwhile, investigations at home and abroad have developed many facts of importance in their bearing upon the subject, and those manufacturers of foods who have been induced by hope of gain or from sheer joy in the exercise of skill, to attempt to evade the meshes of the law, have resorted to new devices that have required detection and suppression where they were against the public interest.

After all these changes, any book published five years ago upon the subject of food inspection and analysis, is old. The food analysts of America have reason, therefore, for pleasure in the fact that Mr. Leach has undertaken the heavy labor of revising his book and of critically selecting the new matter required to bring it up to date; and also in the fact that, his own strength proving insufficient at present for the task, he has associated with him in the revision, Dr. Winton, formerly chemist of the Connecticut Agricultural Experiment Station and now chief of the Chicago Laboratory of the Bureau of Chemistry, a man of like skill and experience with himself, in whose judgment the food chemists of America have with reason come to trust.

The new edition is one fifth larger than the old. In its illustrations the changes are not numerous, but the condensation of old cuts has left room for the addition of a number of new figures of value, and several of the less representative cuts illustrating the histology of the cereals have been replaced by others based upon Dr. Winton's own excellent drawings. The increase in the size of the book is not due to the insertion of new chapters, although two new chapters upon the refractometer and upon flavoring extracts have been formed, in part from matter scattered through the body of the first edition and in part from new material. Nearly every page shows some paragraph improved by change of form or by addition of new matter. These changes are so numerous that space will permit the mention of no more than a few typical examples, such as the modern classification of nitrogenous constituents prepared for the book by Dr. Osborne, the more recent adaptations of

the immersion refractometer to food analysis, methods for the detection of viscogen in cream, Howard's methods for the analysis of ice cream, Robinson's methods for sausage analysis, Bigelow's work on meat extracts, methods for the detection of cold storage eggs, the more recent, simple methods for the determination of moisture in butter, Penfield's system of ash analysis, Bryan's work on starch in compressed yeast, the new sections on bleached flour, diabetic foods, prepared mustard, the Polenske number, methods of analysis for maple products, scientific standards of the International Congress of Sugar Chemists, on Neufeld's, Browne's and Van Dine's studies of honey, on Vasey's and Crampton and Tolman's studies of whiskey, besides the large amount of new matter in the pages upon flavoring extracts, the incorporation of the gist of the new official methods, of the more important food standards, and of the substance of the decisive national regulations. There are, of course, omissions of much that every analyst engaged in this work would be glad to have clearly stated and bound within the same covers; but even a thousand pages have their limits of content, and the matter for congratulation is that the revisers have chosen so well.

The temper of the book is worthy of note. Food adulterations and adulterants have, in these days, become the subject of discussions almost as warm as the importance of the matter merits, and the doctors as well as the writers of the press and laymen have been heard therein. But few echoes of these discussions appear in this book; dialectics have been avoided and mooted matters little discussed.

In a work of such magnitude, matter for criticism can always be found. One wonders why, for example, no mention is made of Horne's dry subacetate for clarification of saccharin liquids, that the Gutzeit method for the determination of arsenic is not presented in the principal section upon that subject, and that Kastle's excellent method for the identification of saccharin receives no mention.

It is deserving of more serious criticism that the official methods and standards are but partially stated, or are given in a modified form, without clear warning in the prefatory matter that for the full and exact statement of these methods and standards reference must be had to the corresponding official publications. The occasional note of departure from the letter of the text on these subjects is insufficient to acquaint the reader unfamiliar with the original texts of the extent and nature of the departures which the limitations of space and probably other excellent reasons have induced.

Deserving also of mention is the fact that this manual deals only with one side of the public analyst's work, and does not attempt the treatment of the forensic phase of his duties. Indeed, from one or two paragraphs in the general chapter of introduction, it may be inferred that the food analyst of America is unlikely to be called upon for very serious or complex work of the forensic character. Thus, in the first edition, the author notes that Massachusetts' experience had indicated that there was little need for the services of trained attorneys in the ordinary course of the enforcement of the food laws, since the trials involved hearings only before courts of magisterial grade where the services of a skilled inspector had proved more valuable than those of trained lawyers without special experience in the kind of causes at issue. In the second edition, this statement is modified to indicate that where the laws are new, the assistance of counsel may be needful.

The experience of the reviewer has compelled him to a very different judgment upon this point. Under present conditions, the real issue joined is not whether the small retailer in a single locality has violated the law and subjected himself to a moderate fine, but whether a given brand or even a given class of goods can safely be handled by any retailer in a large commonwealth. With relative frequency, therefore, food cases are tried in the higher courts with a large array of experts and counsel engaged on behalf of the real defendant, the manufacturer or group of manufacturers concerned; and every point, from the framing of the indictment and the

admissibility of evidence up to the constitutionality of the act is vigorously and skilfully contested on the defendant's behalf. The stress of the contest and the progress of the pure-food movement are such, moreover, that nearly every session of the legislature witnesses some change in the letter of the law that anew requires judicial construction; while decisions on established phraseology are being handed down by the bench in every commonwealth and by the federal courts. Furthermore, where the laws have assumed the civil form, the losses of cases arising from the unskilful preparation of the original records in the magistrates' courts and from the imperfect transcription of these records, have been sufficiently serious to warrant the employment of skilled legal assistance in even the first stages of the prosecution.

There is need therefore not only for legal aid of a high order, but also for the services of lawyers who have given special attention to food laws, the decisions relative thereto, and the general nature of the evidence they must elicit for the proper conduct of their cases. The public analyst should never be made to appear as the prosecutor, but should always be protected from the appearance, as well as the reality of such an attitude. His duty is that of the impartial judge within his own peculiar sphere, not that of the attorney.

For the reasons just set forth for the employment of skilled counsel in the service of food controls, it is likewise clear that the public analyst requires, if he is to be fitted for the highest usefulness in his sphere, special preparation for his forensic duties. It is to be hoped that on this side of his work, some manual will soon be written that shall have in that respect the same high degree of excellence that Mr. Leach's book exhibits on the laboratory side.

WM. FREAR

STATE COLLEGE, PA.,
February 8, 1910

SCIENTIFIC JOURNALS AND ARTICLES

The Journal of Pharmacology and Experimental Therapeutics, Vol. 1, No. 3, issued October, 1909, contains the following: "Experimental Criticism of Recent Results in Testing Adrenalin," by W. H. Schultz. The dilation time is a better index of the relative physiological activity of two adrenalin solutions than is the degree of mydriasis. "On the Relation between the Toxicity and Chemical Constitution of a Number of Derivatives of Choline," by Reid Hunt and R. deM. Taveau. Choline has been found widely distributed in plants and animals, but its function in the organism is yet unsolved. These authors point out that 0.00000001 gram acetyl choline will cause a fall in blood pressure and is only slightly toxic, so that its possibility in therapeutics, perhaps as a substitute for the nitrites, is suggested. "The Action of Adrenalin on the Pulmonary Vessels," by C. J. Wiggers. The difficulties in solving the problem are brought out. "A Clinical Study of Crystalline Strophanthin," by H. C. Bailey. Crystalline strophanthin is a valuable cardiac stimulant in broken compensation due to chronic interstitial nephritis or valvular heart disease. It should not be repeated in twenty-four hours. "The Life-saving Action of Physostigmin in Poisoning by Magnesium Salts," by Don R. Joseph and S. J. Meltzer. Physostigmin is capable of efficiently antagonizing some of the toxic actions of magnesium salts. This is mainly by its action on the respiration. "Note on the Amanita-Toxin," by W. W. Ford and I. H. Prouty.

Number 4 of the same journal issued January, 1910, contains the following articles: "Action of Urea and of Hypertonic Solutions on the Heart and Circulation," by J. A. E. Eyster and A. G. Wilde. In the mammal there is no striking difference evident and the effects of sodium chloride and glucose would seem to be approximately equal to those produced by a solution of urea of equal concentration. "The Inhibitory Action of Phenol on Absorption," by T. Sollmann, P. J. Hanzlik and J. D. Pilcher. Phenol checks intestinal absorption. This is proportionate to the amount of phenol absorbed. "On the Toxicity of Dextro-, Lævo- and Inactive Camphor," by W. E. Grove. The dextro- and lævo-rotatory

camphors differ only quantitatively in action. "Apparatus for Recording the Outflow of Liquids," by W. R. Williams. The mechanical description of an efficient method of recording secretions in physiological work.

RECENT PROGRESS IN METEOROLOGY AND CLIMATOLOGY

That interest in meteorology and climatology is increasing is shown by the advancement made within recent years, in the instruction offered in these fields by American colleges and universities. A comparatively few years ago only a few of the larger eastern universities included such courses among their sciences. At the present time, however, nearly every institution of note offers such electives, while in most agricultural schools these studies are included in the prescribed work. In some institutions, such as the Universities of Iowa and of Wisconsin, the courses are included in the work offered by the department of physics, while in others, notably Harvard and the University of Minnesota, they come under the supervision of the department of geology. A typical example of the rapid growth of interest in these sciences from an educational point of view is seen in the history of the courses in the last named institution. The first course in meteorology at the University of Minnesota was given by Professor C. W. Hall, head of the department of geology, in the spring term of the year 1906–7. This was a half-year course in elementary meteorology and the class numbered ten students, all of whom were juniors or seniors in the academic college. The numbers have grown and the interest has increased to such an extent that during the present school year a course covering one year, and including climatology, has been instituted by Professor E. M. Lehnerts, of the same department, who now has charge of the work. The class in the latter course now numbers seventy-six, of whom forty-seven are juniors and seniors in the academic department, and twenty-nine are freshmen and sophomores in forestry and agriculture.

The last number of the United States Weather Bureau's *Monthly Weather Review* in its accustomed form has recently been issued. As announced by Professor Willis L. Moore, the chief of the bureau, on March 12 last, the *Weather Review* will hereafter be "a monthly report of the weather and climatology of the country, and there will be excluded from its pages everything technical that is not of a purely climatological nature or a current report of weather conditions." While the change was doubtless made after careful deliberation, it is a change that students of meteorology will regret nevertheless, as it leaves the United States without a single meteorological journal of any kind. Although various American journals contain notes from time to time in meteorology and climatology, no magazine is devoted exclusively to these sciences, as are several in Europe. With our extensive weather service and with the increased interest in these fields within recent years, it would seem that the time is now ripe for the institution of a new journal as a private enterprise. Indeed, it is not improbable that the deceased *American Meteorological Journal* would meet with a hearty welcome if it should be resurrected.

Señor V. Castaneda, of the Mexican Weather Service, recently visited the United States for the purpose of studying the methods of distributing weather forecasts, storm warnings and the like, and also of the carrying on of other routine matters of a meteorological service. He spent part of September in the central office of the United States Weather Bureau in Washington, and then visited other stations of the bureau, going as far north as Boston, where he visited the Blue Hill Observatory. He is the second representative of the Mexican bureau to visit this country in such a capacity—the head of the service, Señor Manuel E. Pastrana, having been here for a considerable period three years ago. The object of his mission was to study the scientific basis of weather forecasting and the acquiring of the data from which the forecasts are made. The Mexican Weather Service has done some very creditable work, aside from the daily routine, the most important probably having been the preparation of a cloud

atlas which is now in the hands of the publisher. The bureau is also unique in that it is probably the only national service which attempts to forecast the weather for one month in advance. This feat is rendered somewhat simple, however, by the uniform character of the climate of Mexico.

THE weather service of Argentina under the direction of its chief, Mr. Walter G. Davis, a native of the United States, has expanded considerably within the past year. At present the stations at which simultaneous meteorological observations are made and communicated to the central office in Buenos Ayres form a network which covers all of the republic. Aside from this a beginning has been made toward the carrying on of research work. Mr. George O. Wiggin, the subdirector, also a native of the United States, recently was sent to this country for the double purpose of engaging a number of capable men to enter the service, and also to study the methods of investigating the upper atmosphere as practised by the Blue Hill Observatory and by the Mount Weather Observatory. He spent several weeks at each place, as did also several of the men whom he had obtained to assist in this work when it is begun in Argentina. Mr. S. P. Fergusson, of the former observatory, is now preparing a complete set of kite-flying apparatus for this part of the research work. When this equipment reaches its destination it is the hope of the director to have daily kite flights, similar to those now being carried on at Mount Weather. Such real progress must indeed be gratifying to all interested in the advancement of meteorology.

DURING the week beginning December 6, kites and balloons have been sent up simultaneously, for meteorological purposes, from about forty selected stations scattered throughout the world, including two in the United States—the Mount Weather Observatory and the Blue Hill Observatory. After the results obtained have been computed, they will be sent to the International Commission for Scientific Aeronautics in Strassburg, Germany, and it is expected that much will be learned from them concerning the movements of the upper atmosphere and their relation to conditions at the earth's surface. At the Mount Weather Observatory the work consisted of the usual daily kite flights, as no sounding balloon experiments were possible on account of a delayed consignment of balloons from abroad. At the Blue Hill Observatory pilot balloons were used on Monday and Tuesday, while sounding balloons were sent up from Pittsfield, Mass., under the personal direction of Professor A. Lawrence Rotch, the director of the observatory, on Friday, Saturday and Sunday. The pilot balloons are made of rubber and when filled with hydrogen gas expand to a diameter of about 75 cm. When one of these is liberated its altitude in degrees, together with its azimuth, are observed simultaneously, at the end of each minute, by means of transit instruments placed about a mile apart. From these observations the velocity and direction of the wind for all heights reached by the balloon while it remains visible, can be calculated. Occasionally such a balloon can be seen at both stations for over an hour, and the heights known to have been reached have exceeded ten miles in several instances. As no recording apparatus is attached to it, no attempt is made to recover the balloon, which either rises to a height where it bursts, due to the increased expansion as it rises, or is carried by the prevailing westerly winds aloft far out to sea. The sounding balloons, also made of rubber, are somewhat larger, being about 200 cm. in diameter when expanded, and carry a meteorograph which records the temperature and pressure of the air for all heights reached. They also carry a parachute, which, after the balloon bursts, brings the instrument safely to the ground. The basket covering the instrument bears a message to the finder asking him to return the apparatus intact to the Observatory, for which service he receives the sum of two dollars. Of the three balloons sent up from Pittsfield in the international series, only one of the recording instruments had been returned up to the time of this writing (January 1).

IN the investigation of the upper atmosphere Germany has always been the most ac-

tive, and the experiments carried on in this field by its scientific institutions continue to be an example for other nations to follow. Not only are daily kite flights made and pilot and sounding balloons sent up from a number of well-scattered stations in Germany, but expeditions to carry on similar work have frequently been sent to far distant lands. One such expedition only recently returned from a long and successful visit to equatorial Africa. During the recent international series of simultaneous upper air investigations, five such expeditions carried on these experiments in foreign countries. One of the latter, stationed in the Danish West Indies, carried on its work under the personal supervision of Professor H. Hergesell, one of the founders of, and still a leader in, aerial investigation. Frequently on these expeditions the sounding balloons are sent up from a ship out in a large body of water. The balloons are followed by the ship until they burst, and when the parachute brings the apparatus back to the water surface the instrument and records are immediately recovered.

While polar exploration generally is not primarily for meteorological purposes, the data obtained often contribute greatly to our knowledge of atmospheric conditions in these parts of the earth. It might be said that next to the accounts of previously unvisited lands the meteorological data obtained on these expeditions probably form the most valuable information. Especially important are these data when they contribute information concerning the planetary winds and pressures. Temperature data, while very interesting, are not so important. That the polar regions offer exceptional opportunities for meteorological research is recognized by Count Zeppelin, who is making plans to explore the entire north polar region by means of an airship. In this formidable plan the idea of reaching the pole is only incidental, the enterprise in this case being primarily meteorological. A new British Antarctic expedition is also being organized by Captain R. Scott, the leader of the expedition in the *Discovery*. The meteorological observatons obtained in this expedition, which is to begin the coming summer, will undoubtedly add greatly to our knowledge of Antarctic conditions.

The relation between meteorology and aeronautics is so close that one does not advance without having a similar effect upon the other. While it is true that the former science has not advanced so rapidly during the last two years as has the latter, its advancement has undoubtedly been accelerated by the great progress made in the science of navigating the air. The close union of the two is seen in the following list of names of men prominent in both fields: Hergesell, Zeppelin, Süring, Berson, Rotch, Clayton and Hersey. The men who are really the cause of the recent progress in aeronautics have frequently found it profitable to consult meteorological authorities as to the atmospheric conditions with which an airship has to contend. Moreover, Wilbur Wright, in a recent interview is reported to have said that the progress of the next two years in the art of flying will be largely progress in manipulation and navigation, not in construction, as the past two years have been. In other words, it was his opinion that progress in the immediate future would be in the controlling of the air craft in various atmospheric conditions, rather than in the details of construction—a prophecy which clearly shows the cause of the close relation between the two sciences. Again, Hubert Latham, the well-known foreign aviator, who for a time held the record for height attained by an aeroplane, is quoted as saying that it is easier to navigate the air at moderately great heights than at low heights, because of the steadier, though stronger winds aloft, the varying winds near the surface being as dangerous for an aeroplane as the waves and eddies in the water near a coast are for a ship. A knowledge of such characteristics of the atmosphere is thus of importance in both sciences.

During the past year the United States Weather Bureau has, from time to time, issued a long-range forecast of the weather for the whole of the United States—one forecasting the weather conditions expected for the follow-

ing seven days. Considering the difficulty of the problem, the forecasts have been remarkably successful. While the percentage of accuracy of these forecasts has naturally not been so great as the high standard reached and maintained by the daily forecasts, a good beginning has been made. Doubtless the researches carried on at Mount Weather, especially the upper-air investigation, are already beginning to bear fruit. Meteorological research under the auspices of the United States Weather Bureau is still in its infancy, and no one can tell what may be learned when it has progressed a few years longer. The upper-air investigation gives promise of most desirable results. The daily kite flights under the direction of Dr. William R. Blair have been very successful, the average height obtained being great, while the world's record for height reached by a kite is still held. Since in these experiments the data obtained include temperatures only, it is to be hoped that the other meteorological conditions at the kite may also be obtained. Sounding-balloon experiments have been instituted with fair success by the bureau during the past summer, Omaha and Indianapolis having been selected for the work on account of their central location. It is probable that more of this valuable work will be carried on during the coming year.

As to what may be accomplished for meteorology by men who are thoroughly interested in the science, the history of the Mount Rose Weather Observatory is a striking example. The history of this project is the history of the zeal of a professor of Latin, Professor J. E. Church, Jr., of the University of Nevada, and that of a few of his colleagues whom he interested in the work. The observatory is an automatic one, located upon the summit of Mount Rose, a mountain 10,800 feet in altitude, situated sixteen miles southwest of Reno, Nevada. Begun in 1905, when maximum and minimum thermometers were placed there to obtain further data on summit temperatures in the Sierra Nevada in winter, it was discovered soon afterward that "frost forecasts could be made with considerable certainty from the mountain top in advance of instrumental indications below." This discovery led the Nevada Agricultural Experiment Station in June of the following year "to offer a provisional appropriation of $500 under the Adams Act to supplement the independent effort of the faculty of the university." Following this the work formally became and has continued to be the department of meteorology and climatology of the Nevada Agricultural Experiment Station, with Dr. Church the cooperative observer. Owing to the extremely hazardous transportation, the work of construction proceeded with difficulty, but before the advent of winter the building was completed and some instruments installed. Of the latter the most interesting was a precipitation tank thirty inches in diameter and four feet high with an intake pipe eight inches in diameter and thirty feet long. This instrument was of great value in ascertaining the total amount of snow falling during the winter season, making it possible to estimate the probable amount of water available for irrigation purposes during the following summer. Considering the inaccessibility of the observatory, the records obtained have been fairly complete and are extremely interesting. The instrumental difficulties encountered are summed up by Dr. Church in his last report in which he says: "The perfecting of an automatic meteorograph which will successfully record the weather conditions at high altitudes is the necessary antecedent to a more thorough knowledge of mountain meteorology, and it is at present the most important problem of the observatory." To overcome this problem, Mr. S. P. Fergusson, of the Blue Hill Observatory, who designed and constructed the meteorograph placed by Harvard on El Misti, Peru, was engaged to build a somewhat similar one for the Mount Rose Station. This was completed in due time and, after having been tested at the University of Nevada, it was permanently installed upon the summit of the mountain. While progress was handicapped awaiting the completion and installation of the necessary apparatus, investigations were carried on based upon the records already obtained on

the mountain. Of these the more important were the general climatology of Mount Rose, the relation of climate to the plant environment, the relation of timber to the conservation of snow, and the frost forecasting from the summit. With such a record for its short life, and with ambitious plans for the future, progress is certain to be the result. Having recently been assured of further support by the office of experiment stations of the national government, the zealous workers are almost certain to produce results which will be of great value to meteorology in general and to the agricultural interests of the Great Basin in particular.

Andrew H. Palmer

Blue Hill Observatory,
Hyde Park, Mass.

CONCERNING THE DATE OF THE LAMARCK MANUSCRIPT AT HARVARD

A curious mistake has found its way into M. Landrieu's "Life of Lamarck" regarding the probable date of the Harvard manuscript to which I referred in the March number of the *American Naturalist*. In this article I had stated that the "Manuscrits de Lamarck" were "*brought together* in a volume, the binding dating 1830–40," and that in this little volume there was "a table of contents, probably in the hand of the *early owner* [this does not mean the *author*] of the manuscript." Also that "it will be noted that the papers were *collected* before 1835, the year of the appearance of the second edition of the 'Animaux sans Vertèbres,'" because in the table of contents, referred to above as "in the hand of the early owner" "it is stated that the drawings *will form* part of the second edition" of that work.

Now M. Landrieu remarks in perfect seriousness that I have given the probable date of the *writing* of the manuscript "as before 1835," at which time, as he notes, "Lamarck had been dead six years, after ten years of total blindness!" So I must now smilingly protest that I was aware of the date of Lamarck's death, and even when his eyesight failed him—in fact I mentioned the latter date, as 1818, in the same *Naturalist* paper (p. 148) which my colleague has so imperfectly read. The year 1835 is but a landmark in the Harvard manuscript, since it was at that time or somewhat before that time that its five component parts were brought together in a little volume by the "early owner," who may well have been an editor of the second edition of the "Animaux sans Vertèbres." If, moreover, my good friend M. Landrieu had interpreted the *Naturalist* paper carefully, he might have discovered that I have given the probable dates of various parts of the Harvard manuscript as prior to 1818, "the year in which Lamarck's eyes failed him." So, after all, M. Landrieu's estimate of the date of these manuscripts and my own do not differ widely. He gives the dates between 1810 and 1820—thus he is even less conservative than myself, for he assumes that Lamarck may have continued to write his papers *propria manu* even after his eyesight failed.

Bashford Dean

SPECIAL ARTICLES

THE INTERFERENCE OF THE REFLECTED DIFFRACTED AND THE DIFFRACTED REFLECTED RAYS OF A PLANE TRANSPARENT GRATING, AND ON AN INTERFEROMETER

If parallel light, falling on the front face of a transparent plane grating, is observed through a telescope after reflection from a rear parallel face the spectrum is frequently found to be intersected by strong vertical interference bands. Almost any type of grating will suffice, including the admirable replicas now available, like those of Mr. Ives. In the latter case one would be inclined to refer the phenomenon to the film and give it no further consideration. On closer inspection, however, it appears that the strongest fringes certainly have a different origin and depend essentially on the reflecting face behind the grating. If, for instance, this face is blurred by attaching a piece of rough wet paper, or by pasting the face of a prism upon it with water, so as to remove most of the reflected light, the fringes all but disappear. If a metal mirror is forced against the rear

glass face whereby a half wave-length is lost at the mirror but not at the glass face in contact, the fringes are impaired, making a rather interesting experiment. With homogeneous light the fringes of the film itself appear to the naked eye, as they are usually very large by comparison.

Granting that the fringes in question depend upon the reflecting surface behind the grating, they must move if the distance between them is varied. Consequently a phenomenon so easily produced and controlled is of much greater interest in relation to micrometric measurements than at first appears and we have for this reason given it detailed treatment. It has the great advantage of not needing monochromatic light, of being applicable for any wave-length whatever and of admitting of the measurement of small horizontal angles.

When the phenomenon as a whole is carefully studied it is found to be multiple in character. In each order of spectrum there are different groups of fringes of different angular sizes and usually in very different focal planes. Some of these are associated with parallel light, others with divergent or convergent light, so that a telescope is essential to bring out the successive groups in their entirety. At any deviation the diffracted light is necessarily monochromatic; but the fringes need not and rarely do appear in focus with the solar spectrum. If the slit of the spectroscope is purposely slightly inclined to the lines of the grating, certain of the fringes may appear inclined in one way and others in the opposite way, producing a cross pattern like a pantograph. The reason for this appears in the equations.

In any case the final evidence is given when the reflecting face behind the grating is movable parallel to it. The principal fringes of the interferometer so obtained are subject to the equation (air space e, wave-length λ, angle of incidence i, of diffraction θ'),

$$\delta e = \lambda/2(\cos\theta' - \cos i),$$

and it is therefore less unique as an absolute instrument than Michelson's classic apparatus or the device of Fabry and Perot. Its sensitiveness per fringe depends essentially upon the angle of incidence and diffraction and it admits of but 1 cm. (about) of air space between grating face and mirror before the fringes become too fine to be available. But on the other hand, it does not require monochromatic light (a Welsbach burner suffices), it does not require optical plate glass, it is sufficient to use but a square centimeter of grating film, and it admits of very easy manipulation, for painstaking adjustments as to normality, etc., are superfluous. In fact, all that is needed is to put the sodium lines in the spectrum reflected from the grating and from the mirror into coincidence both horizontally and vertically with the usual three adjustment screws on grating and mirror. Naturally sunlight is here desirable. Thereupon the fringes will usually appear and may be sharply adjusted on a second trial at once.

When the air space is small, coarse and fine fringes (fluted fringes) are simultaneously in focus, one of which may be used as a coarse adjustment on the other. Finally the sensitiveness per fringe to be obtained is easily a length of one half wave-length in the fine fringes and one wave-length in the coarse fringes, though the latter may also be increased almost to the limit of the former.

C. BARUS,
M. BARUS

BROWN UNIVERSITY,
PROVIDENCE, R. I.

THE EFFECT OF ASPHYXIA ON THE PUPIL[1]

IN a recent communication to the Society for Experimental Biology and Medicine (p. 49, December 16, 1908) Dr. John Auer stated that the "Myotic effect of asphyxia in frogs is interesting, as asphyxia in mammals produces chiefly dilatation." We were surprised at this statement, as we had a different impression from having observed the pupils of various animals during asphyxia. As such observations are usually recorded we examined our protocols, and finding our impression con-

[1] From the physiological laboratories of Washington and Pittsburgh universities.

firmed, we have made a few additional observations in order to completely satisfy ourselves in the matter. Having gathered the data, we feel that it should be reported, since we find but slight mention of the phenomena in current physiological treatises we have had the opportunity to examine.[2] We have exhausted the available original sources at our command and very little has been found. We have the impression that very thorough observations have long since been made and recorded, but in view of the above conditions we feel justified in recording briefly our observations in order to recall attention to the phenomena. We may add that we hope to more thoroughly exhaust the literature as opportunity affords, and if it then seems desirable, to publish our results in greater detail.

Our data show that in all animals observed, only momentary or no dilatation of the pupils occurs during the first stage of rapid asphyxia (*e. g.*, by bleeding or by clamping the trachea or by insufflating the lungs with carbon dioxide or hydrogen gas), and that as a rule a *very marked constriction* of the pupils occurs during this stage. We have observations on sheep, rabbit, guinea pig, squirrel, rat, mouse, dog, cat, chicken, guinea fowl, pigeon, dove, sparrow and snake. As yet our data are incomplete on the effect of section of the nerves governing the pupil on the asphyxial changes.

It is interesting to note the post mortem differences observed in the size of the pupils in different animals, *e. g.*, cats show wide dilatation, while common gray rabbits, as a rule, show marked constriction. It is known that the eye (excised) of a frog or eel constricts its pupil on exposure to light, and dilates it in the dark; and that even the isolated iris of the eel contracts in the light.[3]

[2] For example, Starling, "Text-book of Physiology," p. 404, 1907, merely mentions constriction of the pupils in early stages of asphyxia; Paton, "Essentials of Human Physiology," 1905, p. 306, states that in the initial stage of acute asphyxia the pupils are small, while a number of writers do not mention it at all.

[3] Stewart, "Manual of Physiology," fifth edition, p. 798.

Photic stimulation, the "at rest" condition of the pupil, etc., obviously should be taken into consideration in drawing conclusions on the size of the pupil in the eyes of dead animals or in excised eyes.

C. C. Guthrie,
F. V. Guthrie,
A. H. Ryan

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
SECTION D

Profiting by the experience of former meetings and in accordance with the actions of the council and section at the Baltimore meeting, the chairman and secretary of Section D, in arranging the program for the Boston meeting, had in mind, in addition to the accommodation of papers volunteered by the members at large, a program, to be covered in a small number of sessions and in the compass of two days, which should provide: (*a*) a "general interest" session, including the address of the retiring vice-president; (*b*) a series of solicited papers on aeronautics and related subjects; (*c*) a joint session with Sections A and B.

As a result of the plans thus formulated, the section held a session on Tuesday morning, December 28, at which in addition to the business of the organization and election of officers, papers on miscellaneous subjects were presented; a session on Wednesday morning, devoted to papers on aeronautics, and the general interest session on Wednesday afternoon. On Tuesday afternoon the members of the section attended a joint session of Sections A and B.

Professor A. Lawrence Rotch was elected chairman of the section and a vice-president of the association for 1910; Professor W. J. Humphreys, member of the sectional committee for five years; President F. W. McNair, member of the council for 1910, and Mr. A. M. Herring, member of the general committee for the Boston meeting.

Vice-president J. F. Hayford presided at all meetings of the section. The program in detail is given herewith:

TUESDAY A.M., DECEMBER 28

"Some Notes on the Cutting of Music Rolls and on a New Machine for Making Master or Pattern Rolls," J. F. Kelly, Pittsfield, Mass. (Presented by Walter Reed.)

"A Pitot Tube Steam Meter," E. H. Lockwood, New Haven, Conn.

"Production Engineering," A. A. Hamerschlag, Pittsburgh, Pa. (Presented by the secretary.)

"Recent Improvements in Ore Concentration Machinery," R. H. Richards, Boston, Mass.

"A Parallel Rule," H. E. Wetherill, Philadelphia, Pa. (Read by title.)

"The Photographic Lens as an Engineering Instrument," E. H. Berry, East Orange, N. J. (Read by title.)

WEDNESDAY A.M., DECEMBER 29

"The Changes of the Wind with Altitude," A. J. Henry, Mount Weather, Va. (Presented by W. J. Humphreys.)

"Wind Pressure and Velocity," S. P. Ferguson, Hyde Park, Mass.

"The Relation of Wind to Aeronautics," A. Lawrence Rotch, Hyde Park, Mass.

"Turbulent Surface Winds," W. J. Humphreys, Washington, D. C.

"Aerodynamics," A. M. Herring, New York, N. Y.

"Vertical Air Currents and their Office in Supporting a Moving Aerofoil," F. W. Very, Westwood, Mass.

"The Center of Pressure on Arched Surfaces," M. B. Sellers, Fireclay, Ky. (Read by title.)

"Interference of Aeroplane Surfaces due to Grouping," M. B. Sellers, Fireclay, Ky. (Read by title.)

"Vagaries of Air Currents," A. T. Atherholt, Philadelphia, Pa. (Read by title.)

"The Pneumodynamic and the Thermodynamic Function," J. M. Siebel, Chicago, Ill. (Read by title.)

"General Design for an Aerial Machine of High Speed and Efficiency," David Todd, Amherst, Mass. (Read by title.)

"Some Applications of the Laws of Aerial Viscosity to Problems of Aviation," F. W. Very, Westwood, Mass. (Read by title.)

WEDNESDAY P.M., DECEMBER 29

Vice-presidential address[1]—"The Profession of Engineering and its Relation to the American Association for the Advancement of Science," G. F. Swain, Boston, Mass.

"The Development of the Modern Textile Mill," C. J. H. Woodbury, Boston, Mass.

"The Present Status of Aerial Navigation,"[2]

[1] Published in full, SCIENCE, February, 1910.

[2] To be published in full in SCIENCE.

Octave Chanute, Chicago, Ill.

The meetings of the section were well attended, the papers were valuable contributions and the discussions interesting. Those responsible for the program appreciate the efforts of the members who prepared and presented the papers and feel that the meeting was in all respects very encouraging.

G. W. BISSELL,
Secretary

EAST LANSING, MICH.

THE AMERICAN PHYSIOLOGICAL SOCIETY

THE twenty-second annual meeting of the American Physiological Society was held in the physiological laboratories of the Harvard Medical School, Boston, Mass., December 28–30, 1909. Sixty-nine of the one hundred and sixty members of the society were in attendance. The officers of the meeting were W. H. Howell, president, and R. Hunt, secretary.

The following papers and demonstrations occupied the six scientific sessions:

JOINT MEETING WITH SECTION K—PHYSIOLOGY AND EXPERIMENTAL MEDICINE—AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Address of the retiring vice-president—"Chemical Regulation of the Body-processes by Means of Activators, Kinases and Hormones," W. H. Howell.

Symposium on Internal Secretion:

"A General Review of the Chemical Aspect of Internal Secretion," R. H. Chittenden.

"The Internal Secretion of the Pancreas," W. G. McCallum.

"Our Present Knowledge of Thyroid Function," S. P. Beebe.

"Metabolism after Parathyroidectomy," J. V. Cooke.

"Physiological Consequences of Total and of Partial Hypophysectomy," H. Cushing.

JOINT SESSION WITH THE AMERICAN SOCIETY OF BIOLOGICAL CHEMISTS

"On the Reversible Reaction for the Liberation of Carbonic Acid from the Blood in the Lung," L. J. Henderson.

"The Action of Certain Substances on the Respiratory Center," A. S. Loevenhart (with W. E. Grove).

"Some Reactions of Lipase of Human Pancreatic Juice," H. C. Bradley.

"The Action of the Blood Proteins on the Isolated Mammalian Heart," W. H. Howell (for L. W. Gorham and A. W. Morrison).

"The Absorption of Fluid from the Peritoneal Cavity," L. Loeb (with M. L. Fleisher).

"The Distribution of Glycogenolytic Ferment in the Animal Body," J. J. R. Macleod.

"Sugar Production from Amino-acids in Metabolism," A. I. Ringer and G. Lusk.

"Further Studies on the Internal Secretion of the Thyroid," A. J. Carlson and A. Woelfel.

"Metabolism of Purin Derivatives," L. B. Mendel and J. F. Lyman.

"The Relation of Ptyalin Concentration to the Diet and to the Rate of the Secretion of Saliva," A. L. Crittenden and A. J. Carlson.

"The Action of Isotonic Solutions of Neutral Salts on Unfertilized Echinoderm Eggs," R. S. Lillie.

"The Food Requirements for Growing Children," E. W. Rockwood.

"The Sensitizing and Desensitizing Action of Various Electrolytes on Muscle and Nerve," R. S. Lillie.

"Sudan III. and the Absorption of Fat," R. H. Whitehead.

"The Effect of Inanition and of Various Diets upon the Resistance of Animals to Certain Poisons," R. Hunt.

"Do Muscle and Blood Serum contain Kreatinin?" P. A. Shaffer.

PAPERS PRESENTED AT THE OTHER SESSIONS

"The Effect of External Temperature upon the Peripheral Circulation," A. W. Hewlett.

"The Effect of Exercise upon Venous Pressure," D. R. Hooker (with J. M. Wolfsohn).

"Changes in the Heart during Hemorrhage," C. J. Wiggers.

"On the Relation of the Vasomotor Center to Afferent Impulses," W. T. Porter.

"Effect of Stimulation of the Splanchnic Nerve on the Glycogenolytic Ferments of Lymph and Blood," J. J. R. Macleod.

"The Influence of Alcohol on Metabolism," L. B. Mendel (with W. W. Hilditch).

"The Summation of Stimuli," F. L. Lee (with M. Morse).

"Influence of Ethyl Alcohol upon the Life Cycle of Paramœcium," C. F. Hodge (with W. A. Matheny).

"The Influence of Thyroid-parathyroidectomy on the Ammonia-destroying Power of the Liver," A. J. Carlson (with Clara Jacobson).

"Energy Metabolism in Parturient Women," T. M. Carpenter and J. R. Murlin.

"Mammalian Heart Strips together with a Theory of Cardiac Inhibition," J. Erlanger.

"The Velocities of some Physiological Actions," C. D. Snyder.

"On the Mode of Action of the Glomerulus of the Kidney" (with demonstration), T. G. Brodie.

"Apnea Vera in Anesthesia," M. M. Scarborough and Y. Henderson.

"The Cortico-spinal Tract in the Rat," J. L. Kin .

"On Protein Assimilation," P. A. Levene (with G. M. Meyer).

"On the Condition of the Spinal Vaso-motor Pathways in Shock," F. H. Pike.

"The Influence of Dietetic Alterations on the Types of Intestinal Flora," C. A. Herter (with A. I. Kendall).

"Observations upon the Blood Pressure of the Sheep under Local and General Anesthesia," M. Dresbach.

"On the Distribution of Antibodies in Normal and Immune Animals," L. Hektoen and A. J. Carlson.

"On the Cause of Diurnal Variation in Body-temperature," S. Simpson.

"The Pressure of Bile Secretion in the Herbivora," S. Simpson.

"Microscopical Structure of the Neurite," C. F. Hodge (with H. B. Davis).

"Respiratory Waves of Blood Pressure in Man," J. Erlanger (with E. G. Festerling).

"Further Studies on the Influence of Copious Water Drinking with Meals," P. B. Hawk.

"An Observation on the Chemical Regulation of Respiration," Y. Henderson.

"The Gaseous Metabolism of the Heart during Vagus Inhibition," W. H. Howell (for J. M. Wolfsohn and L. W. Ketron).

"Congenital Thyroidism; an Experimental Study of the Thyroid in Relation to Other Glands of Internal Secretion," R. G. Hoskins.

"The Primitive Movements of the Vertebrate Embryo," S. Paton.

"The Action of Urea upon the Heart," F. P. Knowlton.

"Physiological Effects of the Marathon Race, Circulatory and Renal Systems," J. H. Barach (with J. W. Boyce and W. L. Savage).

"The Relation of the Pancreas to Sugar Metabolism," W. M. Baldwin.

"Some Urinary Findings in Eclampsia," L. B. Stookey. (Read by title.)

"The Action of Magnesium Salts on Internal Respiratory Processes," C. C. Guthrie. (Read by title.)

DEMONSTRATIONS

E. G. Martin: Some apparatus used in the quantitative study of faradic stimuli.

W. B. Cannon: Nerve cells of the myenteric plexus subjected to anemia for different periods.

W. B. Cannon: The influence of tonus on peristalsis.

Y. Henderson: Demonstration of a simple gas meter.

D. R. Joseph and S. J. Meltzer: The mutual antagonism between magnesium and barium.

J. Auer (with P. Lewis): Demonstration of anaphylactic immobilization of the lungs in guinea-pigs.

W. H. Schultz: A simple respiration apparatus.

S. J. Meltzer: A demonstration of the method of respiration by continuous intratracheal insufflation.

In the afternoon of December 29 the members of the society visited the Carnegie Nutrition Laboratory, where demonstrations were given by Dr. F. G. Benedict and assistants.

Owing to the rapidly increasing number of active workers in physiology in this country and the consequent growth of the society, the number of papers presented at the annual meetings has now become so great that their reading and adequate discussion in the time allotted for the meeting is practically impossible. In the hope of remedying this situation, at least in part, it was voted to limit henceforth the time of presentation of all papers to ten minutes, and that abstracts of the papers be furnished the secretary in time for printing before the meetings. It is hoped that with printed abstracts of the papers in the hands of every member attending, less time will be required for their presentation and more time given to the discussions.

An appropriation of $50 was voted for the fund now being raised by the French physiologists for the erection of a monument to Marey.

The following new members were elected: F. C. Becht, of the University of Chicago, and J. B. Leathes, of the University of Toronto.

The president appointed the following delegates to the International Zoological Congress at Graz: R. G. Harrison and A. J. Carlson; to the International Congress of Physiologists at Vienna: R. Hunt and A. J. Carlson.

Officers for the ensuing year:

President—W. H. Howell.
Secretary—A. J. Carlson.
Treasurer—W. B. Cannon.
Additional Members of the Council—J. Erlanger and F. S. Lee.

A. J. CARLSON,
Secretary

THE UNIVERSITY OF CHICAGO

SOCIETIES AND ACADEMIES

THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

AT the 442d regular meeting, held February 15, 1910, Miss Rovena Buell, of the American School for Classical Studies at Rome, presented a paper on "Amulets," illustrating her discourse with interesting specimens collected by herself chiefly in Italy. In the making of this collection of Italian amulets the effort has been to bring together those in modern use and their ancient parallels. The sixty specimens may be roughly divided thus:

1. Prophylactics against the evil eye, having in form some relation to a horn and representing phallicism, Diana worship, and defensive symbolism by means of the hand. Examples—a phallus, a tiger's claw, a boar's tusk, a crab's claw, coral and shell horns, lunar crescents, composite horned animals, hands making the sign of the *fico* and the sign of the horns.

2. Amulets that make the sound of metal, hateful to evil spirits. Examples—bells, clashing disks and pendants.

3. Grotesque and ocular guards against malevolence. Examples—masks, a humpback, compositions or stones resembling eyes.

4. Preventives and cures by suggestion. Examples—a fossilized trochus, "eye of Santa Lucia," for eye maladies, a limonite concretion with a loose inner particle, "*pietra gravida*," for miscarriage, fossilized corals, "witch stone," for witch spells, carnelian and jasper, "blood stones," for heart disease and hemorrhages, bronze and silver fish, for female sterility, a comb, for caked breasts (caused by the presence of a witch's hair), a dried sea horse, to increase milk in the breasts, a red woolen sack containing bread crumbs, salt, incense and wheat from a field ripe but unspoiled by the harvester's iron, to guard against the evil eye and witchcraft.

5. Charms pertaining to animals. Examples—badger's hairs, for defense against witches, claw of a paradise bird and a monkey's paw, valid against the evil eye.

6. Roman Catholic amulets. (*a*) Authorized by

the church. Examples—the Agnus Dei and medal of St. Benedict for divers bodily ills and storms. (*b*) Unauthorized, but popularly endowed with specific virtues. Examples—the medal of the Three Magi, "witch money," the medal of St. Anthony, Hermit, for animal protection, St. Joseph's carpenter's rule for child protection, the pig of St. Anthony for luck, the medal of St. Andrea Abellino for apoplexy, the coin and the key of the Holy Spirit for infantile convulsions.

Votives. Examples—primitive Etruscan figurines of bronze, 800 B.C., ancient Roman bead incised *HER*, terra cotta heads.

In the discussion following the reading of the paper Dr. J. W. Fewkes dwelt on the amulets used by the Indians, while Dr. E. L. Morgan referred to those worn by the negroes of Washington, such as dog's teeth, etc.

Mr. George R. Stetson followed with a paper on "Some Social Fallacies."

It was universally accepted that in the millennium of perfect literacy crime would cease. But as mental culture, which by no means includes moral education, increases our sensibility and self-esteem, it also increases our ability to accumulate wealth, to acquire social position, and thus to escape the consequences of our criminal acts. The fallacies in the practise and administration of the law are made apparent in its discrepancies and defects. Decisions should be made and punishments administered without sentiment and be reformatory in character and purpose, taking into consideration the apparent motive, the circumstances of the deed and the culture of the perpetrator. A censure was also expressed against such attorneys who maintain their clients' cause *per fas et nefas*, so that many criminals are shielded from the penalty of their crimes and society is thus rendered defenceless, as is proved by statistics. Indiscriminate mercy as well as indiscriminate punishment is criminal. The power of pardon which is so frequently abused, should under our form of government be permissible only to the sovereign people in their houses of assembly. The fallacy of absolute human equality. Organic equality is nowhere found, nor does equality of opportunity produce equality in results. Hence there is also no economic equality. Absolute political, social and economic equality would not only check our progress in civilization, but also destroy what we have attained. The fallacy of excessive specialization and division of labor which results in mental and physical deterioration, in unrest and discontent. Fallacies in history and literature were illustrated by numerous examples. The fallacies of politics, statistics and legislation likewise came in for their share, concluding with a discussion of the fallacies of the missionary and civilizing enterprises.

Remarks on the paper were made by Drs. Folkmar, Casanowicz and Lamb and by Mrs. Sarah S. James.

I. M. Casanowicz,
Secretary

The American Philosophical Society

At a meeting of the society on February 18, a paper entitled "The Tunnel Construction of the Hudson & Manhattan Railroad Company" was read by J. Vipond Davies, chief engineer.

The population of New York and its suburbs in New York and New Jersey has grown to a total of 6,527,000 persons, of which some 1,691,000 reside in the district in New Jersey. The traffic across the ferries of the Hudson River before the tunnels were opened to business was 125,000,000 persons per annum. No other excuse or explanation is needed for the construction of the Hudson River tunnels.

This work involved every type of tunnel construction developed by modern machinery and methods, but more particularly the so-called "shield" method, under which there are provided, (1) for supporting soil, eliminating water and making a safe place for workmen, the use of *air pressure;* (2) for supporting soil and partially removing same, for making a safe place for men, the use of a *hydraulic shield;* (3) for a permanent lining the use of *metal plates;* (4) for putting in place the lining the use of an *erector;* and (5) for waterproofing and protection the use of *cement grout.* All these methods were fully described in detail.

The American Chemical Society
New York Section

The fifth regular meeting of the session of 1909–10 was held at the Chemists' Club on February 11.

The following papers were presented:

"Nucleic Acids," P. A. Levene.

"Determination of Sodium Chloride in Milk," Paul Poetschke.

"Some Colloid-chemical Aspects of Digestion, with Ultra-microscopic Observations," Jerome Alexander.

"The Fate of Amino Acids in the Organism," Graham Lusk.

C. M. Joyce,
Secretary